

CONTRACTOR: Georgia Tech Research Corporation
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Atlanta, Georgia 30332-0420

TITLE OF REPORT: Electron Spectroscopy for Chemical
Analysis - Sample Analysis

DATE: 5 January 1989

TYPE OF REPORT: Final

REQUISITION NUMBER: 1-7-EH-91814(1F)

GEORGIA TECH PROJECT #: E18-654

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NASA PD# H98048B

(NASA-CR-183568) ELECTRON SPECTROSCOPY FOR
CHEMICAL ANALYSIS: SAMPLE ANALYSIS Final
Report (Georgia Tech Research Inst.) 60 p

CSCI 07D

N89-23634

Unclas
G3/25 0192827

This Final Report consists of the two interim reports which were prepared during the course of the project: Reports MSFC-01 and MSFC-02. All spectra are presented in a single appendix.

REPORT MSFC-01

I. INTRODUCTION

This report describes the results of the ESCA analysis of the specimens listed in Table 1, which were supplied by MSFC.

TABLE 1
Specimens Analyzed with ESCA

Specimen	Exposure Conditions in Atomic Oxygen
KAPTON-4	Control (no exposure)
KAPTON-5	Exposed at 45°C, 60 W, 30 Min.
KAPTON-6	Exposed at 45°C, 60 W, 95 Min.
HDPE-19	Control (no exposure)
HDPE-20	Exposed at 45°C, 60 W, 30 Min.
HDPE-21	Exposed at 45°C, 60 W, 95 Min.
PVDF-4	Control (no exposure)
PVDF-5	Exposed at 45°C, 60 W, 30 Min.
PVDF-6	Exposed at 45°C, 60 W, 95 Min.

ESCA was performed on an SSL-100/206 Small Spot ESCA spectrometer. This instrument utilizes monochromatized Al K α x-rays that are focused to a spot on the specimen. All data were taken with the use of a low voltage electron flood gun and a charge neutralization screen to minimize charging effects on the data. The charge neutralization screen is made of nickel and thus Ni photoionization peaks are seen in some of the spectra. Oxygen on this screen may produce small O 1s peaks. Nickel peaks and any possible contributions to the O 1s peak from the nickel screen have been neglected in the analyses that follow.

The voltage of the low energy electron flood gun was set by collecting C 1s spectra and adjusting the flood gun voltage to the nearest integral voltage setting that minimized the peak widths. Slight charging effects can be seen in a few of the

spectra as a small shoulder on the low binding energy side of the effected peaks.

Because the specimens are electrically insulating and charged in the x-ray beam, it was not possible to obtain an independent binding energy reference. The C 1s photoionization peak obtained from HDPE is often assigned a binding energy of about 285 eV. This peak can thus be used as an internal binding energy reference for the HDPE specimens. Such an approach is difficult to apply to Kapton and PVDF. The C 1s spectra of Kapton contain several component peaks that make the assignment of an internal binding energy reference difficult. Although PVDF contains CH₂ bonds (as does HDPE), the secondary substituent effects of F alter the C 1s binding energies.

The x-ray spot size and electron flood gun voltage used are recorded on the individual spectra as are the instrumental resolutions. Two resolutions were utilized, resolutions 4 and 2. Resolution 4 is the lowest resolution available on the instrument while resolution 2 is the second greatest available.

Two types of spectra were obtained for each specimen:

1. General Surveys

General surveys were taken with the 1000 μ m diameter spot (the largest available) at resolution 4 from a binding energy of -10 eV to 1090 eV. This 1100 eV range is the largest of which the spectrometer is capable.

2. High Resolution Spectra

High resolution spectra were obtained of the most intense photoionization peaks for the major elements represented in the general surveys. These spectra were taken at resolution 2 using a 300 μ m diameter x-ray spot. The high resolution spectra span a binding energy range of 20 eV.

Two types of data reduction were performed:

1. Semiquantitative Compositional Analysis

General surveys were analyzed semiquantitatively for the atomic composition of the specimen surfaces. This was performed with the aid of the spectrometer software which takes into account relative photoionization cross sections for the atomic levels involved and the instrument response. The effect of electron mean free path variation, which may be as large as a factor of 2, is ignored

The major photoionization peaks are labeled on the general surveys as are the major Auger peaks. The Auger peaks are indicated by an "A" following the elemental symbol.

2. Peak Fitting

The high resolution spectra were resolved into the fewest number of Gaussian components required for a reasonable fit. C 1s components were of FWHM 1.35 eV, and the O 1s components were of FWHM 1.84 eV. The widths of the N 1s and F 1s components were about 1.8 and 2.1 eV, respectively.

II. DATA ANALYSIS

A. Compositional Analysis.

The spectra collected are presented in the appendix. Table 2 lists the composition of the surface of each specimen as determined semiquantitatively from its general survey. The atomic percents are given to the nearest percent and thus may not sum to 100%.

B. Analysis of Specimens: KAPTON-4, KAPTON-5, and KAPTON-6.

The general survey from the control specimen (KAPTON-4) indicates that the specimen surface is composed primarily of C, O, and N (the constituents of KAPTON H). The C 1s spectrum of this specimen resolves into three components: 1. an aromatic

component at a binding energy of about 281 eV due to the C atoms bonded to only C and H, 2. an unresolved aromatic component at about 282.2 eV, which is due to C atoms singly bonded to O or N, and 3. a component due to carbonyl type bonds ($C=O$). The C 1s spectrum is similar to those for untreated KAPTON H in the published literature.¹

There appears to be a single component to the N 1s spectrum of the unexposed specimen and two components of approximately equal magnitude to its O 1s spectrum. The O 1s component at the greatest binding energy corresponds to the ether bonded O ($C-O-C$) while the component at the least binding energy is due to carbonyl bonded O ($C=O$). O 1s spectra in the literature display a carbonyl component that is about twice the size of the ether component in contradiction to what is seen here (see footnote).

TABLE 2
Surface Composition of Polymer Specimens

Specimen	Atomic Concentration (%)			
	C	N	O	F
KAPTON-4	78	6	16	-
KAPTON-5	70	6	24	-
KAPTON-6	67	7	25	-
HDPE-19	97	-	3	-
HDPE-20	83	-	17	-
HDPE-21*	84	-	15	-
PVDF-4	56	-	1-2	42
PVDF-5	53	-	5	42
PVDF-6	54	-	5	41

* HDPE-21 had about 1% Ca on its surface.

¹M. Kogoma and G. Turban, Plasma Chemistry and Plasma Processing, 6 (4), (1986) 349.

Both general survey spectra of the plasma exposed specimens (KAPTON-5 and KAPTON-6) indicate an increased O concentration relative to the unexposed specimen. The C 1s spectra of these specimens consist of several components: 1. two components at low binding energies, which are due to the C-C-C, and the C-O and C-N bonds in KAPTON H, and 2. possibly three components at greater binding energies, which are due to C atoms in increased oxidation states. The proportion of C atoms in the greater oxidation states, i.e., greater than those of C-C-C, C-O, and C-N, is larger after plasma exposure than before. These three components represent about 89 percent of the C 1s signal prior to plasma exposure and about 64 percent after plasma exposure.

The N 1s spectra taken from the plasma exposed KAPTON H specimens appear to be comprised of two components. The separation between the resolved peaks is about 1.1 eV. The component at the greater binding energy may be due N-O bonds.

The O 1s spectra from the plasma exposed specimens resolve into two components of approximately equal magnitude. The existence of two resolvable components after exposure to an RF oxygen plasma is consistent with the literature as is the fact that their relative magnitudes are unchanged by the plasma (see footnote).

C. Analysis of Specimens: HDPE-19, HDPE-20, and HDPE-21.

The general survey from the control specimen (HDPE-19) indicates that the specimen surface is primarily composed of C and O. As there should be no O in the pure polymer, the O may be due to a slight oxidation of the surface and/or contamination. The solvent used to clean the specimen may have been the source of the O observed. The C 1s spectrum of this specimen contains two (2) components: 1. a major peak due to CH₂ bonds in HDPE that appears at a binding energy of about 280 eV (shifted due to charging) and 2. a small peak shifted upwards in binding energy from the major peak by about 4.2 eV that is probably due to oxidation of C.

Both general survey spectra of the plasma exposed specimens (HDPE-20 and HDPE-21) indicate an increased O concentration relative to the unexposed specimen. Both the relative and absolute increase in surface O concentration after plasma exposure are greater for the HDPE than for either KAPTON H or PVDF (see TABLE 2).

The C 1s spectra of the plasma exposed specimens consist of several components: 1. a major component due to CH_2 bonds, and 2. several components at larger binding energies that correspond to C in various states of oxidation. The differences between the spectra from these two specimens cannot be considered significant since only one spectrum of each type was taken from each specimen.

D. Analysis of Specimens: PVDF-4, PVDF-5, and PVDF-6.

The general survey from the control specimen (PVDF-4) indicates that the specimen surface is composed of primarily F and C. There is a minor amount of O, which is probably due to contamination.

The C 1s spectrum of the unexposed specimen consists of two resolvable components separated by about 4.5 eV. That at the lowest binding energy is due to CH_2 and that at the highest binding energy is due to CF . It appears from the FWHM of these components that each is probably composed of several unresolved components due to various nonideal structures in the polymer, eg., CHF .

The F 1s spectrum of the unexposed specimen is fit well with a single Gaussian peak. The O 1s spectrum resolves into two components separated by 1.0 eV.

Both general survey spectra of the plasma exposed specimens (PVDF-5 and PVDF-6) indicate an increased O concentration relative to the control specimen.

The C 1s and F 1s spectra of the plasma exposed specimens are similar to those of the unexposed specimen. The separation between these photoionization peaks also is unchanged by plasma

exposure. The O 1s spectra of the plasma exposed specimens resolve into two components of similar magnitude and separated by about 1.4 eV.

From this data, it is not possible to determine whether the oxidation state of C is changed by plasma exposure.

III. SUMMARY

Plasma treatment appears to oxidize all of the polymers examined. Evidence for this are the increases in O on the specimen surfaces after plasma exposure and the increases in the relative amounts of C in various oxidized states following exposure.

Although the relative oxygen increase of the PVDF was greater than that of the KAPTON H specimen, the absolute increase for the PVDF was the smallest observed (see TABLE 2 and recall that KAPTON H contains structural O). The PVDF specimens displayed the least O both prior to plasma exposure and after plasma exposure. Absolute amounts of O due to plasma exposure increase in the order: PVDF < KAPTON < HDPE.

I. INTRODUCTION

This report describes the results of the ESCA analysis of the specimens listed in Table 1, which were supplied by MSFC. ESCA data collection and reduction were performed as described in Report # MSFC-01 dated 23 August 1988.

TABLE 1
Specimens Analyzed with ESCA

Specimen	Exposure Conditions in Atomic Oxygen
MYLAR CONTROL MYLAR-11	Control (no exposure) Exposed at 45°C, 60 W, 75 Min.
POLYPROPYLENE CONTROL POLYPROPYLENE-11	Control (no exposure) Exposed at 45°C, 100 W, 90 Min.

II. DATA ANALYSIS

A. Compositional Analysis.

The spectra collected are presented in the appendix. Table 2 lists the composition of the surface of each specimen, with the exception of specimen Mylar-11, as determined semiquantitatively from its general survey. The surface of Mylar-11 has a substantial amount of Sb on it. Since the Sb 3d5/2 photoionization peak overlaps the O 1s photoionization peak, quantification was not possible. The Mylar control specimen may have a small amount of Sb on it (see below), which has been ignored in the quantification. The atomic percents are given to the nearest percent and thus may not sum to 100%.

B. Analysis of Specimens: MYLAR AND MYLAR-11.

The general survey from the control specimen (MYLAR) indicates that the specimen surface is composed primarily of C and O, with a trace of F and possibly Sb contamination. The C 1s

spectrum of this specimen resolves into five components.

TABLE 2
Surface Composition of Polymer Specimens

Specimen	Atomic Concentration (%)				
	C	O	F	Al	Na
MYLAR MYLAR-11 *	75	24	0.5	-	-
POLYPROPYLENE	97	3	-	-	-
POLYPROPYLENE-11	80	14	2.5	3	0.5

* The surface of MYLAR-11 consists primarily O and C, with smaller amounts of Sb, Ca, Na, N, and P.

The O 1s spectrum of the unexposed specimen resolves into two components.

The general survey spectra of the plasma exposed specimen (MYLAR-11) indicates an increased O to C ratio relative to the unexposed specimen. The C 1s spectrum of this specimen differs from that of the unexposed specimen. Assuming that the C 1s peak that appears at 282.1 eV on the control specimen is due to C in the same state as that which produces the peak at 273.9 eV on the exposed specimen, the average C 1s binding energy is greater on the exposed specimen than on the control. The lack of an absolute binding energy reference (see Report # MSFC-01) prevents a more conclusive analysis at this time.

The O 1s spectrum of the plasma exposed specimen overlaps the Sb 3d5/2 peak. Peak fitting was not attempted. The Sb 3d3/2 peak can be seen at a binding energy of about 529.5 eV.

C. Analysis of Specimens: POLYPROPYLENE and POLYPROPYLENE-11.

The general survey of the control specimen (POLYPROPYLENE) indicates that the specimen surface is composed primarily of C and O. As there should be no O in the pure polymer, the O may be due to a slight oxidation of the surface and/or contamination.

The solvent used to clean the specimen may have been the source of the O observed.

The C1s spectrum of this specimen resolves into two primary peaks due to the different bonding states of C in the polymer and a small peak at a greater binding energy. This small component may be the result of surface oxidation.

The O 1s spectrum of the control specimen resolves into two components.

The general survey spectrum of the plasma exposed specimen (POLYPROPYLENE-11) indicates an increased O to C ratio relative to the unexposed specimen. Several impurities also are present on the plasma exposed specimen, which are not seen on the control.

The C 1s spectrum of the plasma exposed specimen is broader than that from the unexposed specimen and resolves into three primary components and one or more components at greater binding energies. This structure is consistent with oxidation of the polymer.

The O 1s peak of the plasma exposed specimen resolves into two components.

III. SUMMARY

Plasma treatment appears to oxidize both of the polymers examined. Evidence for this are the increases in O on the specimen surfaces after plasma exposure and the increases in the relative amounts of C in various oxidized states following exposure.

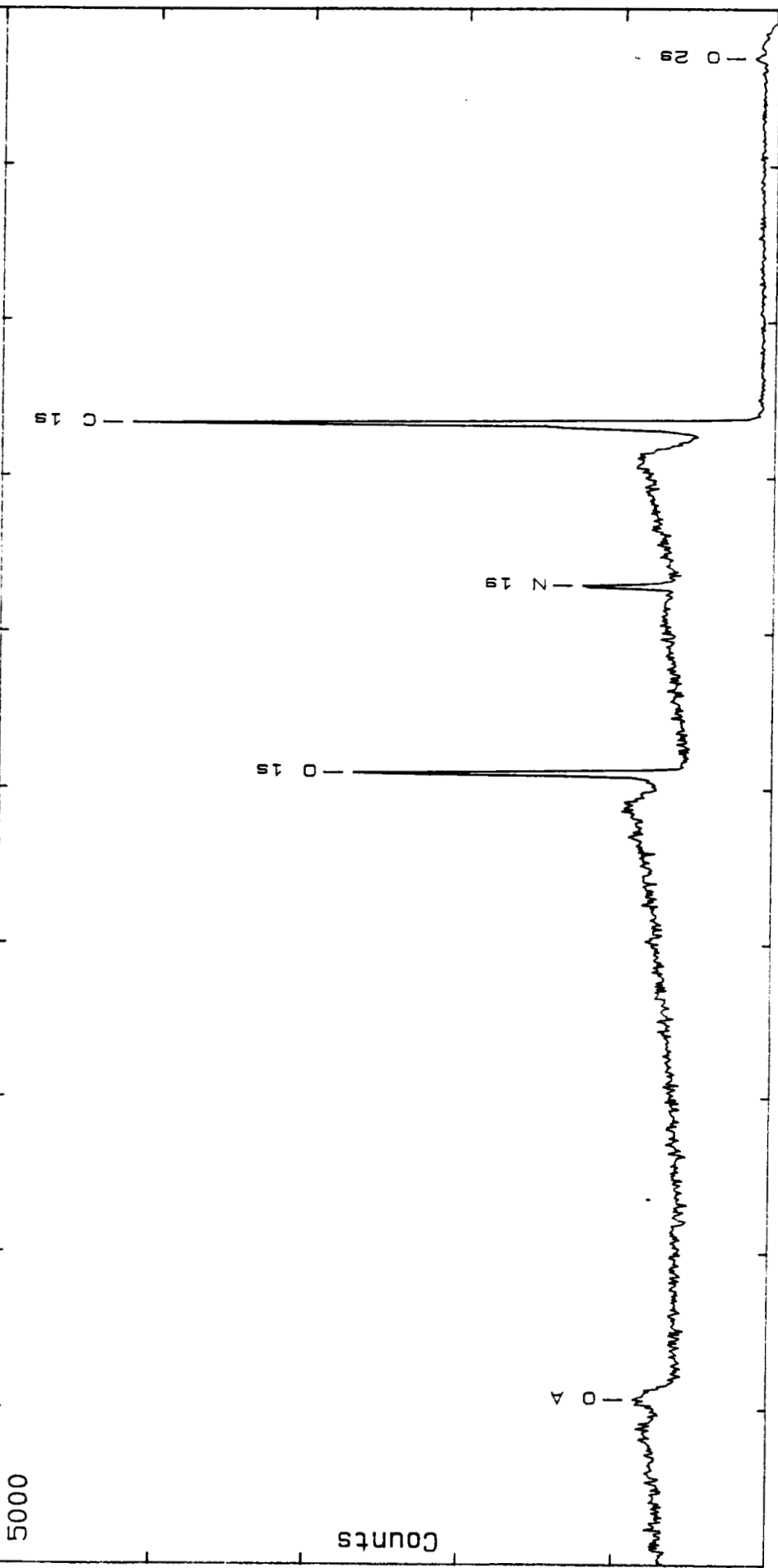
It is not possible to quantify the relative extent of the oxidation observed because of the difficulty imposed by the presence of Sb on MYLAR-11 (see above). In any case, this would most likely be a meaningless exercise since the specimens were exposed in different systems under different conditions.

The surfaces of both plasma exposed specimens contained impurities. This may be indicative of contamination in the plasma reactors.

APPENDIX

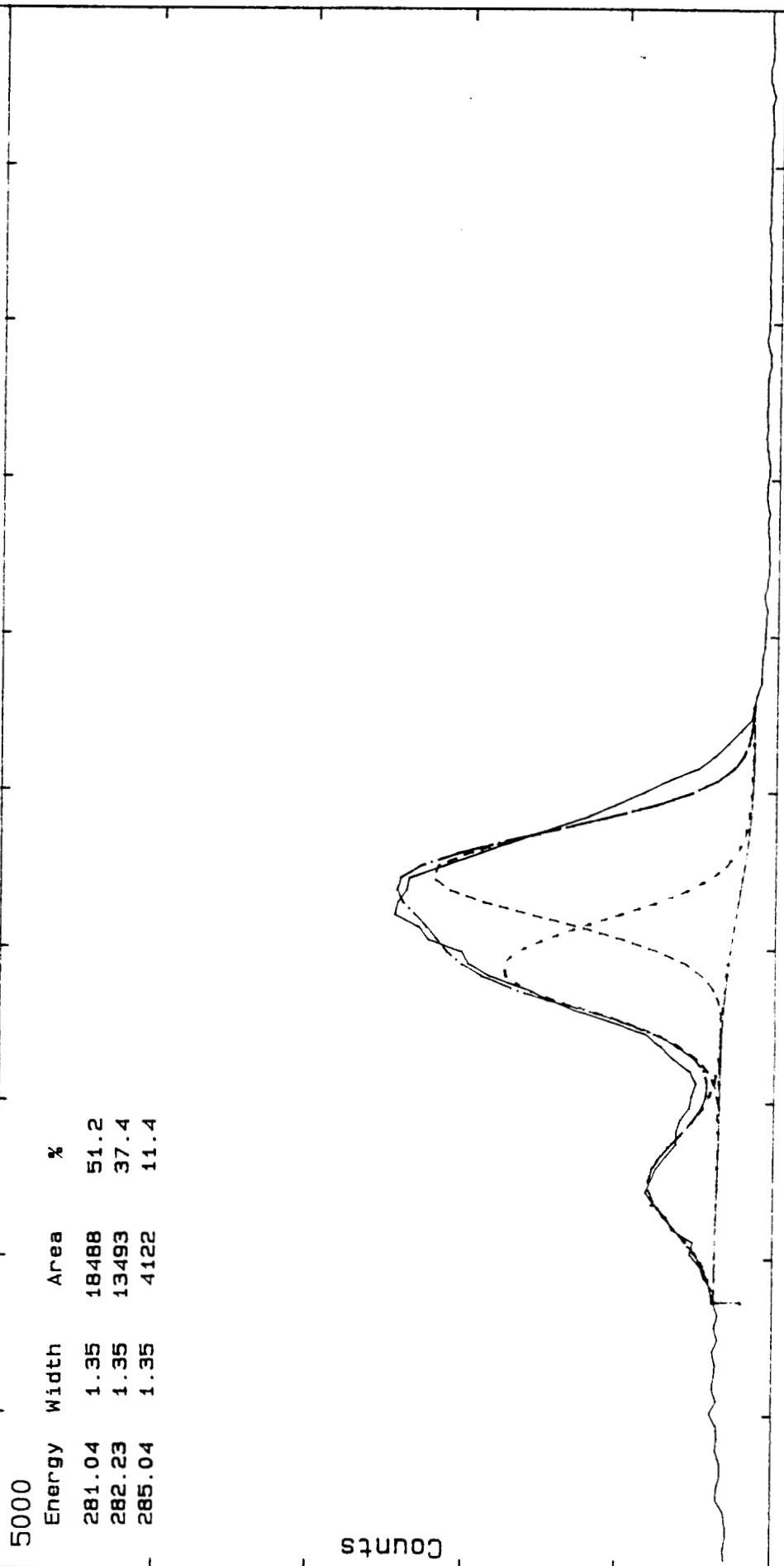
ESCA SPECTRA

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Report #: MSFC-01

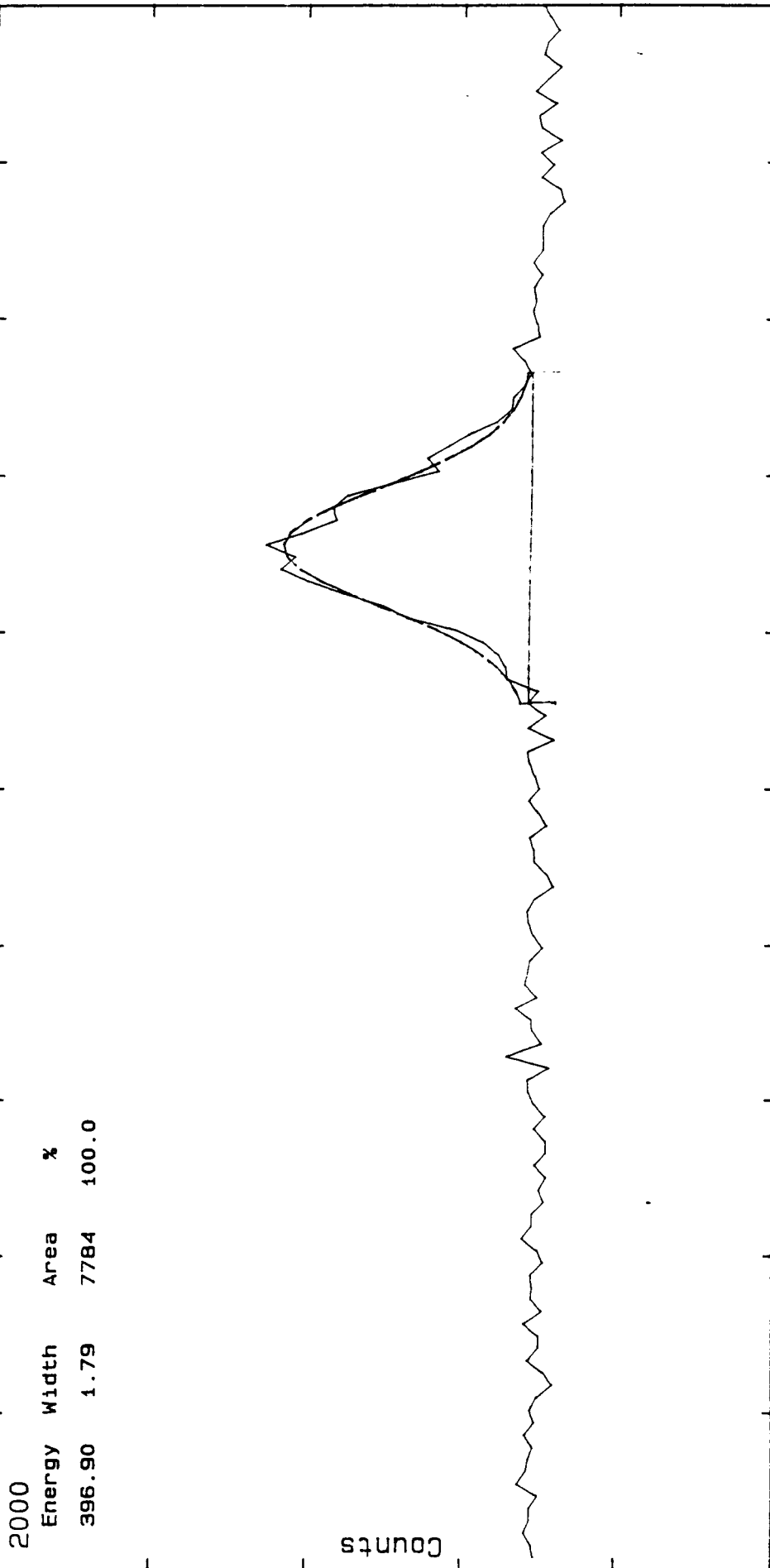
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Description: KAPTON-4 (CONTROL). C 1s SPECTRUM CHARGE NEUTRALIZATION SCREEN			
Operator: WBC			



File: KPTNMRS12	Date: 8/16/1988	Spot Size: 300 u	Flood Gun: 1.0 eV
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Description: KAPTON-4 (CONTROL), N 1s SPECTRUM
 CHARGE NEUTRALIZATION SCREEN

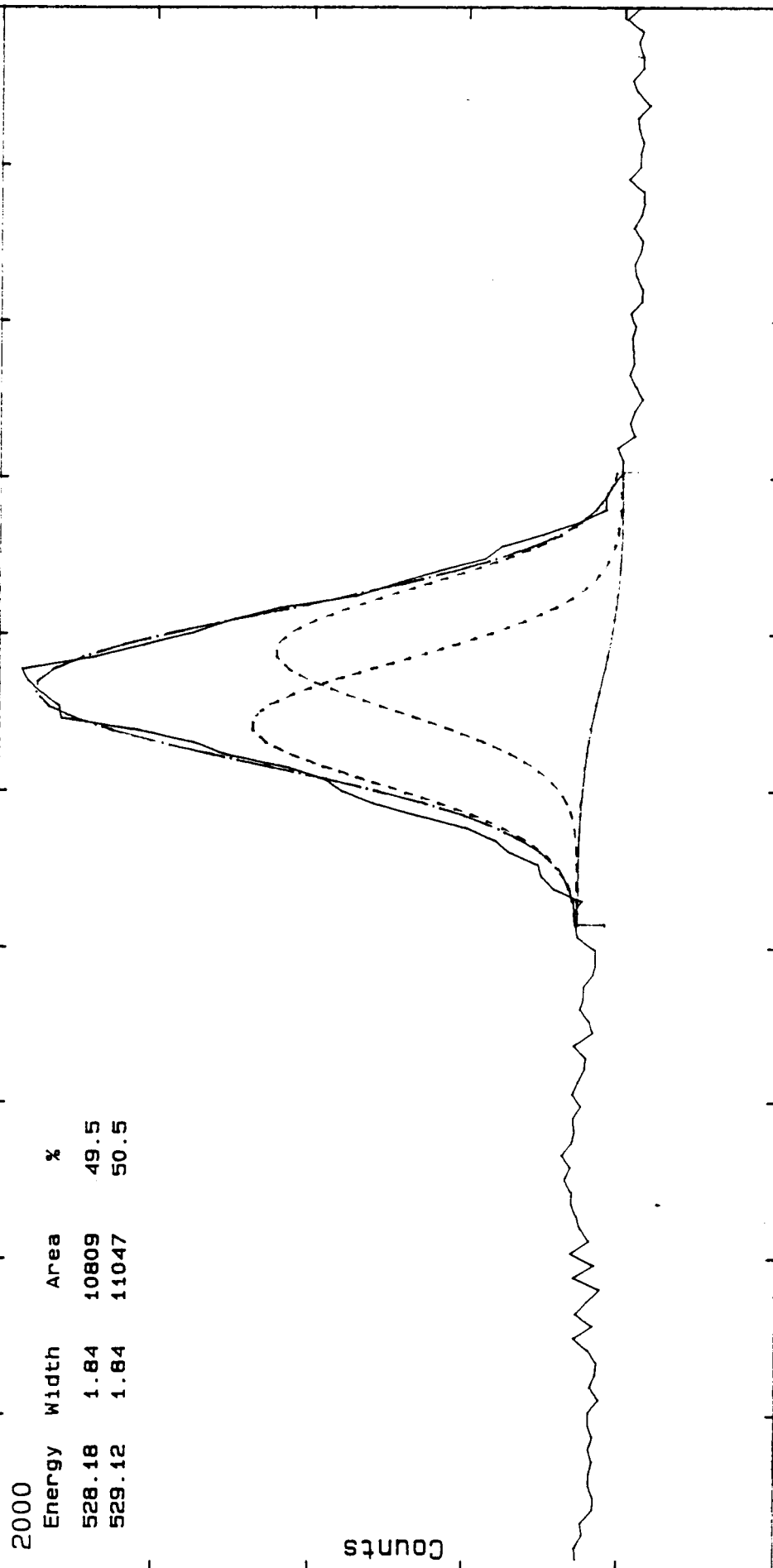
Operator: WBC



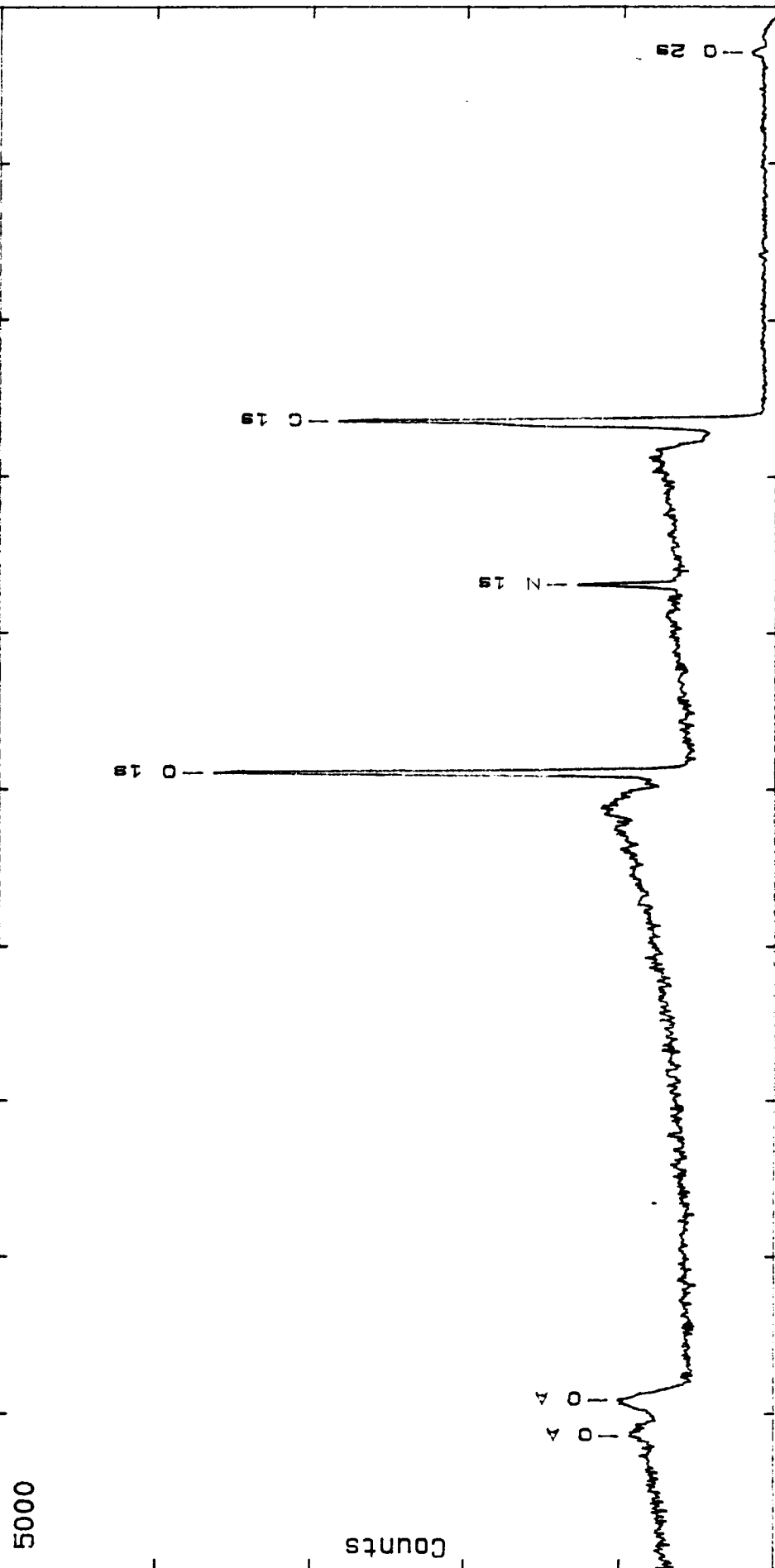
410.0 Binding Energy (eV) 390.0

Report #: MSFC-01

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CHARGE NEUTRALIZATION SCREEN			

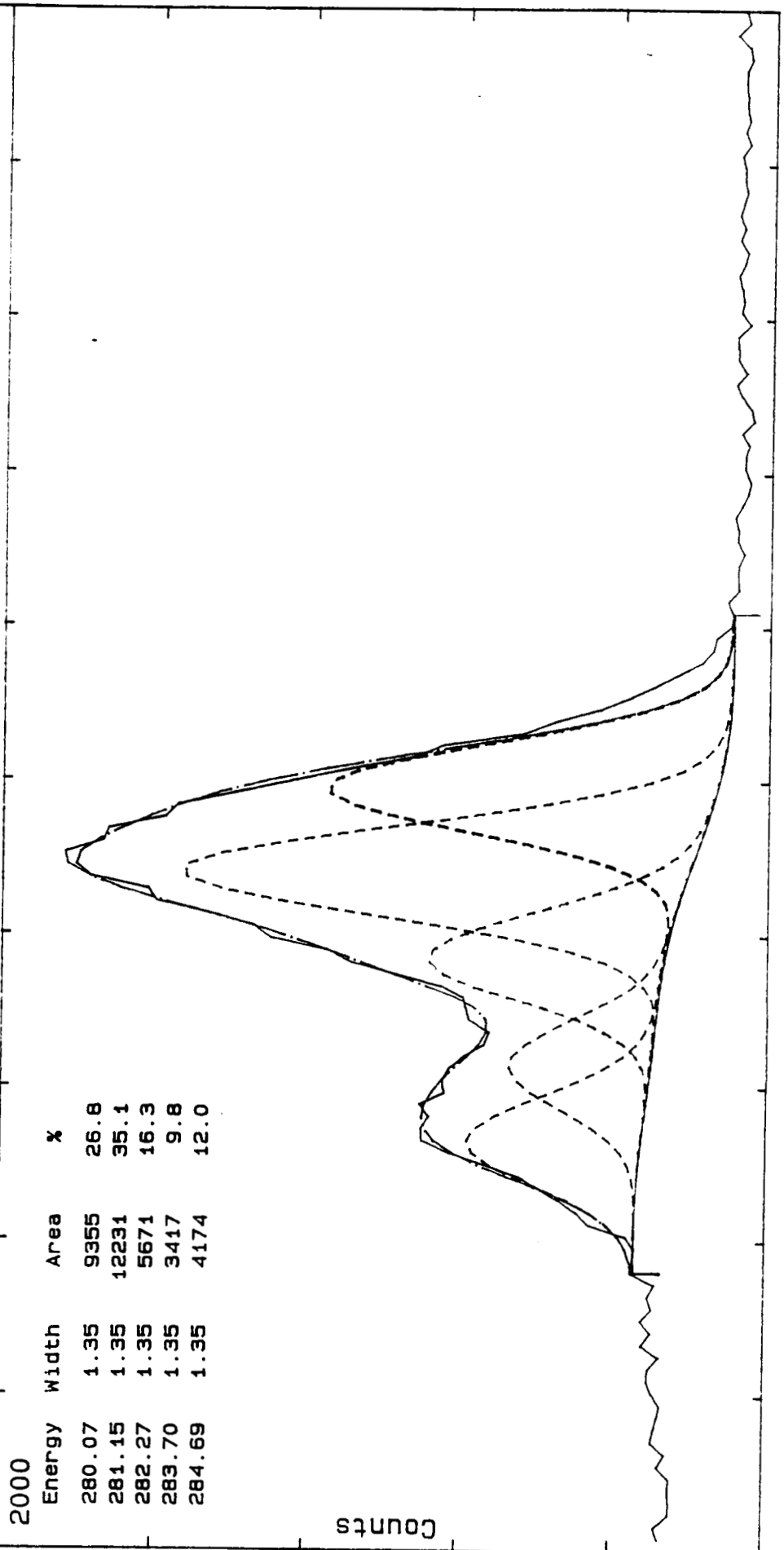


File: KPTNMRS13	Date: 8/16/1988	Spot Size: 1000 u	Flood Gun: 2.0 eV
Region 1	Disc: NASA01	# of Scans: 1	Resolution: 4
Description: KAPTON-5, PLASMA EXPOSED: 45 DEG C, 60 W, 30 MIN. Operator: WBC			
CHARGE NEUTRALIZATION SCREEN			

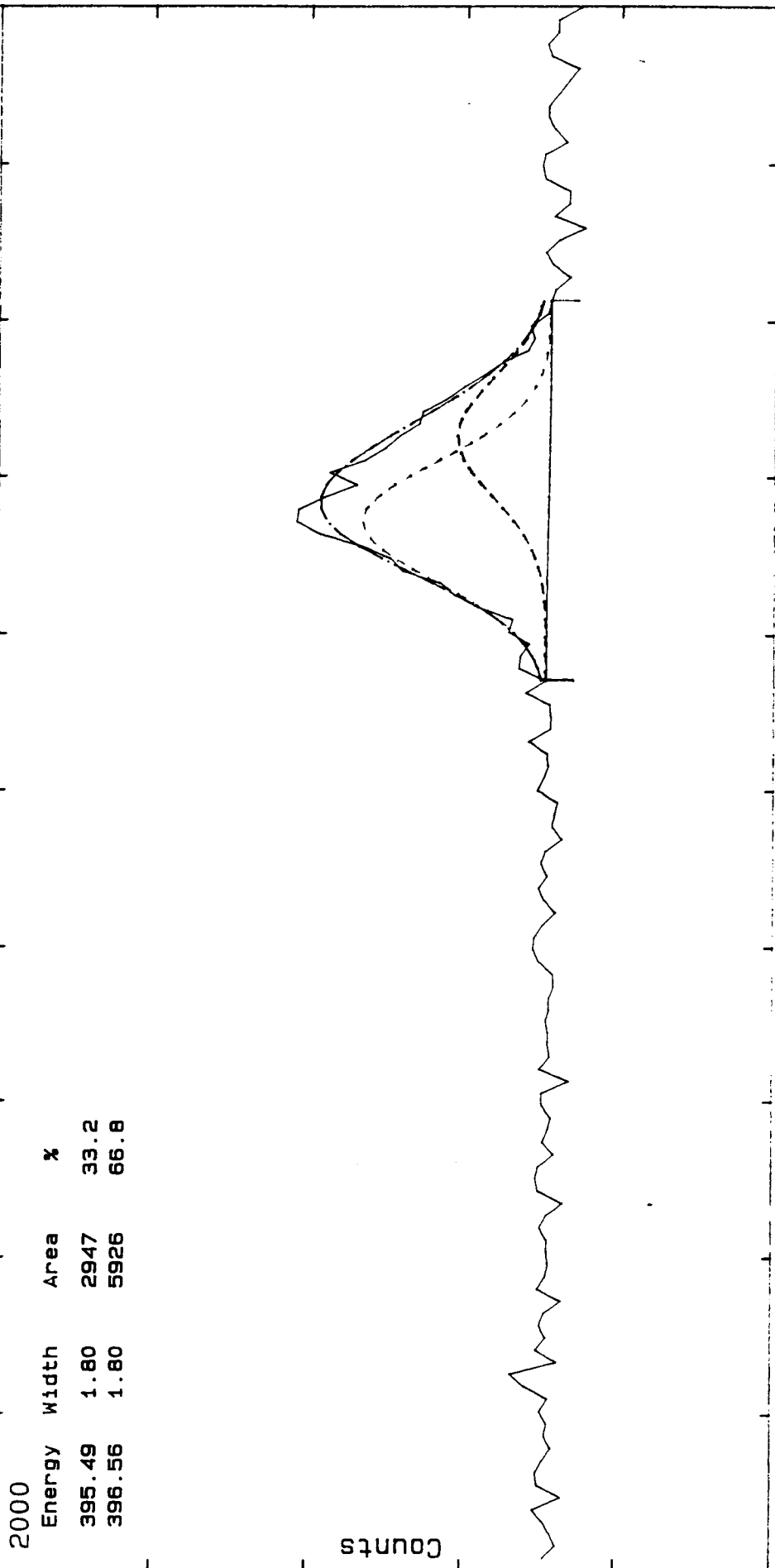


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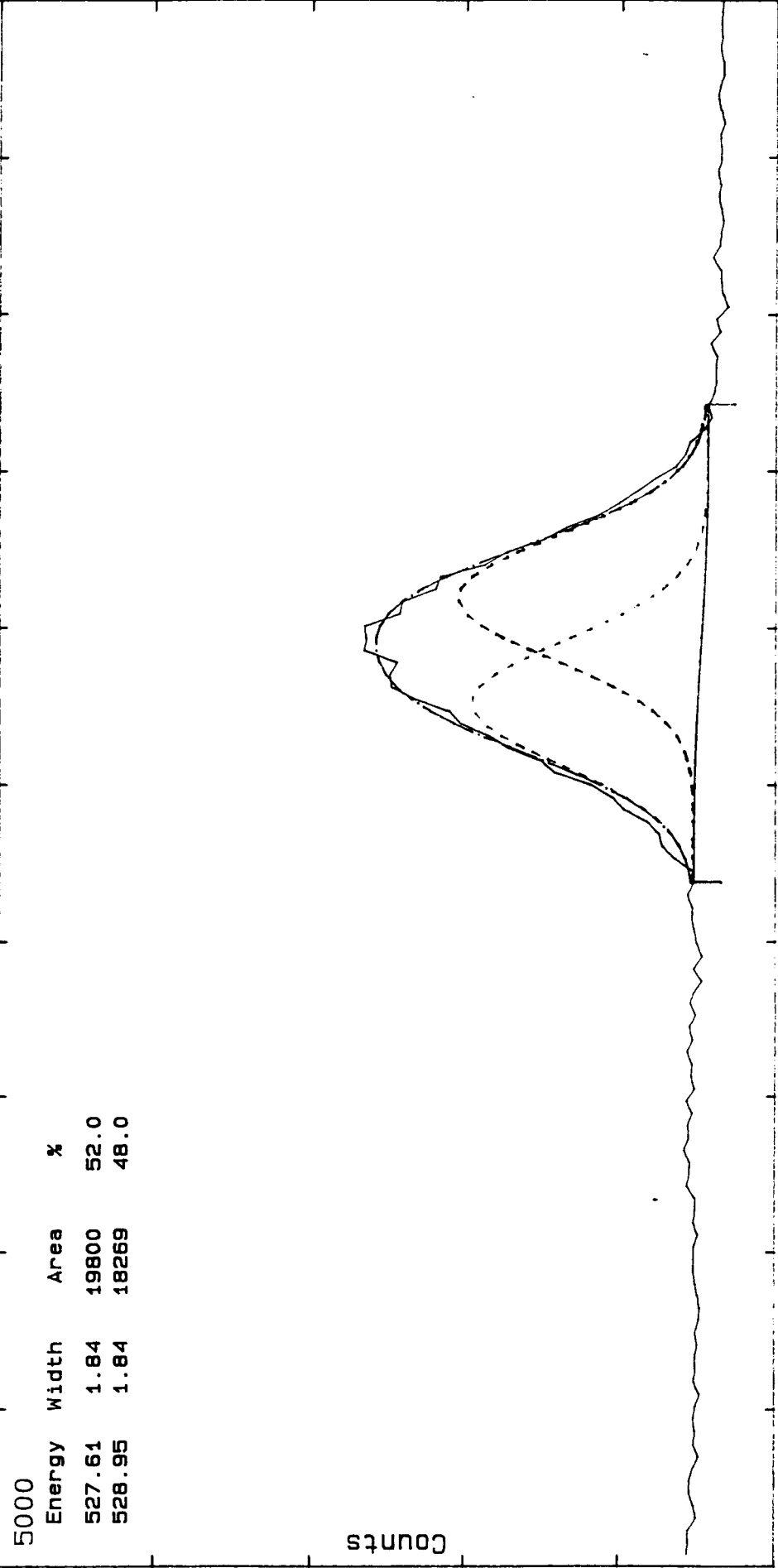
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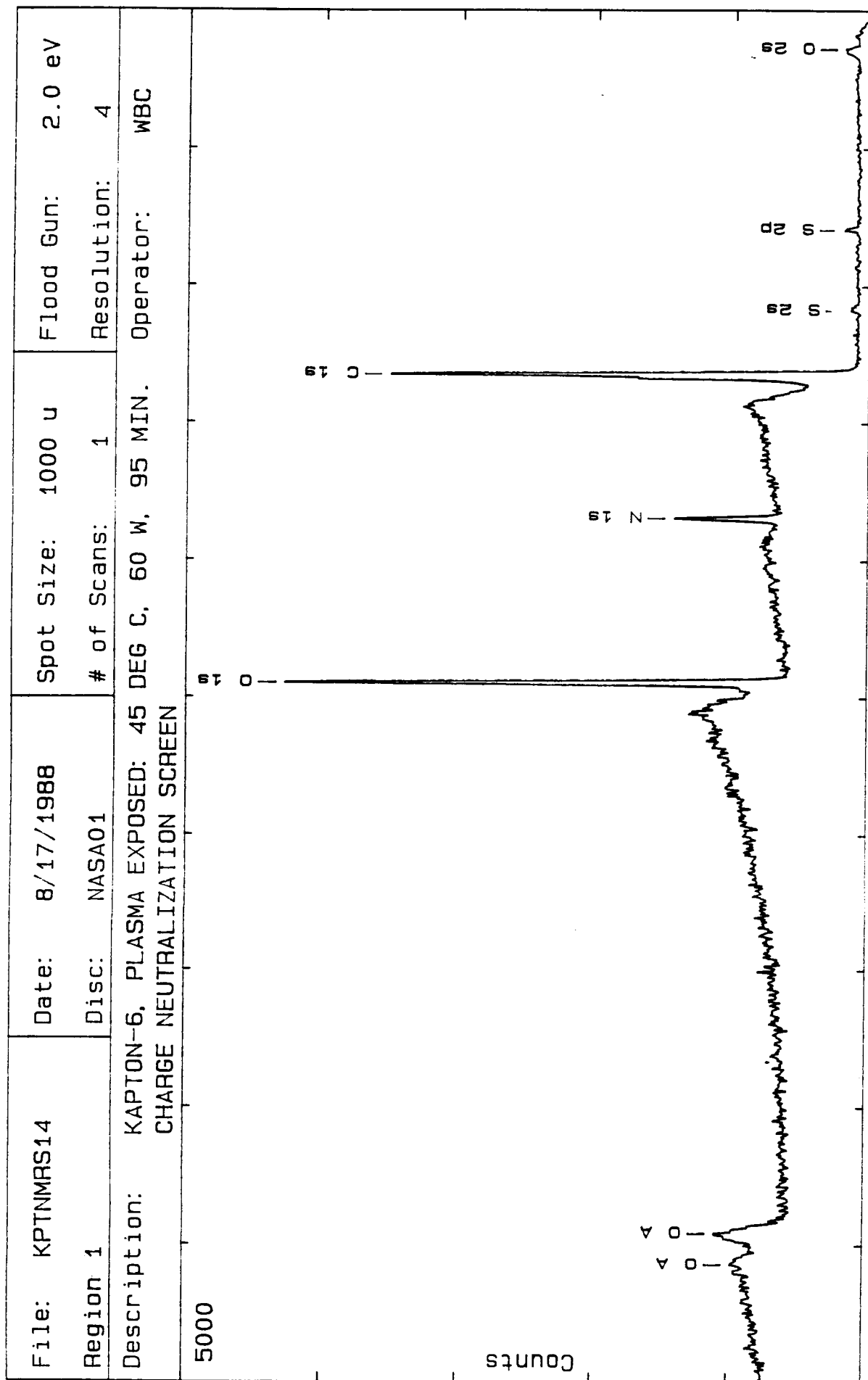


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File: KPTNMRS13	Date: 8/16/1988	Spot Size: 300 u	Flood Gun: 2.0 eV
Region 4	Disc: NASA01	# of Scans: 10	Resolution: 2
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1090.0

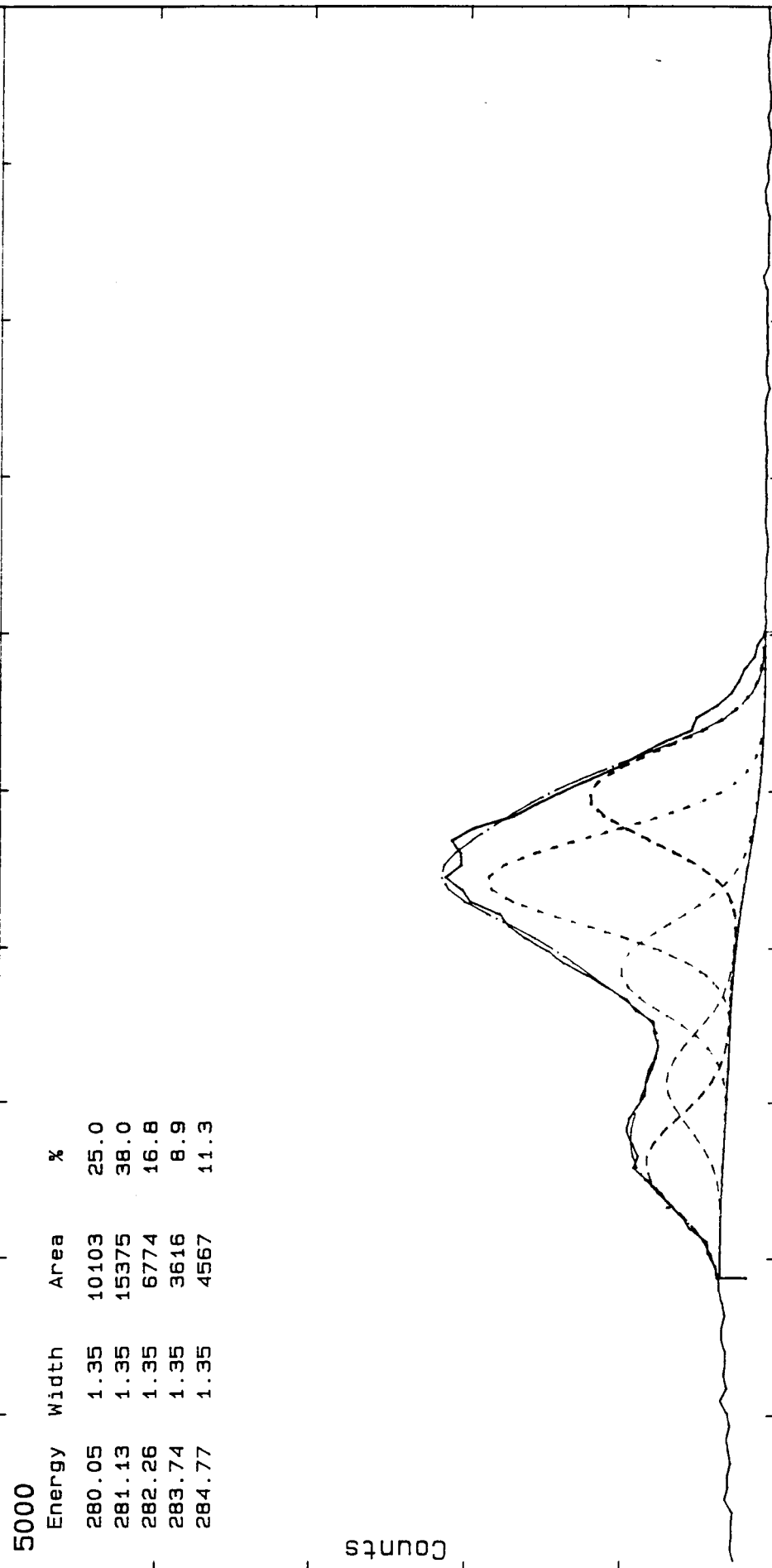
Binding Energy (eV)

-10.0

Report #: MSFC-01

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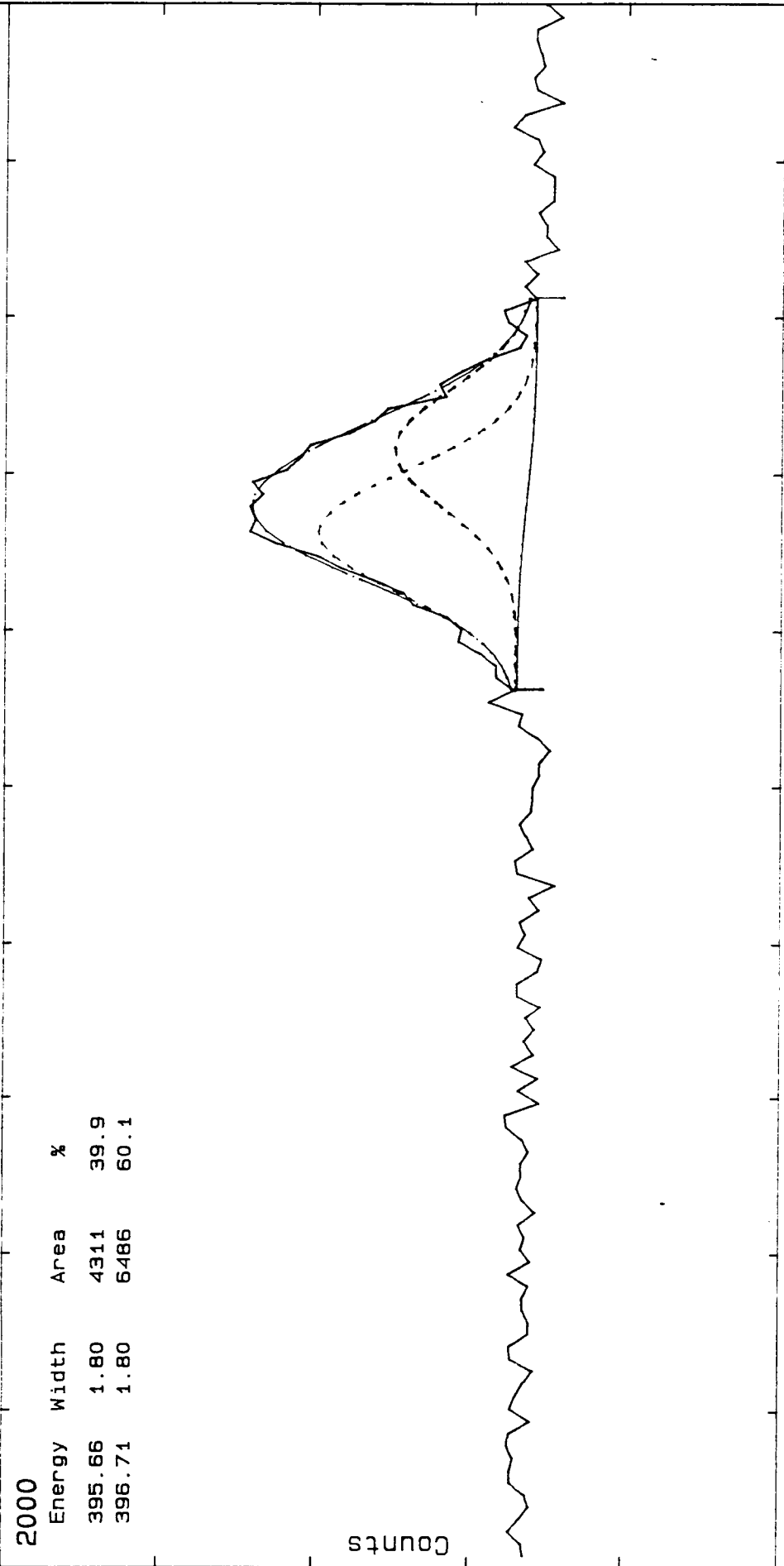
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 60 W, 95 MIN., CHARGE NEUTRALIZATION SCREEN



290.0 Binding Energy (eV) 270.0

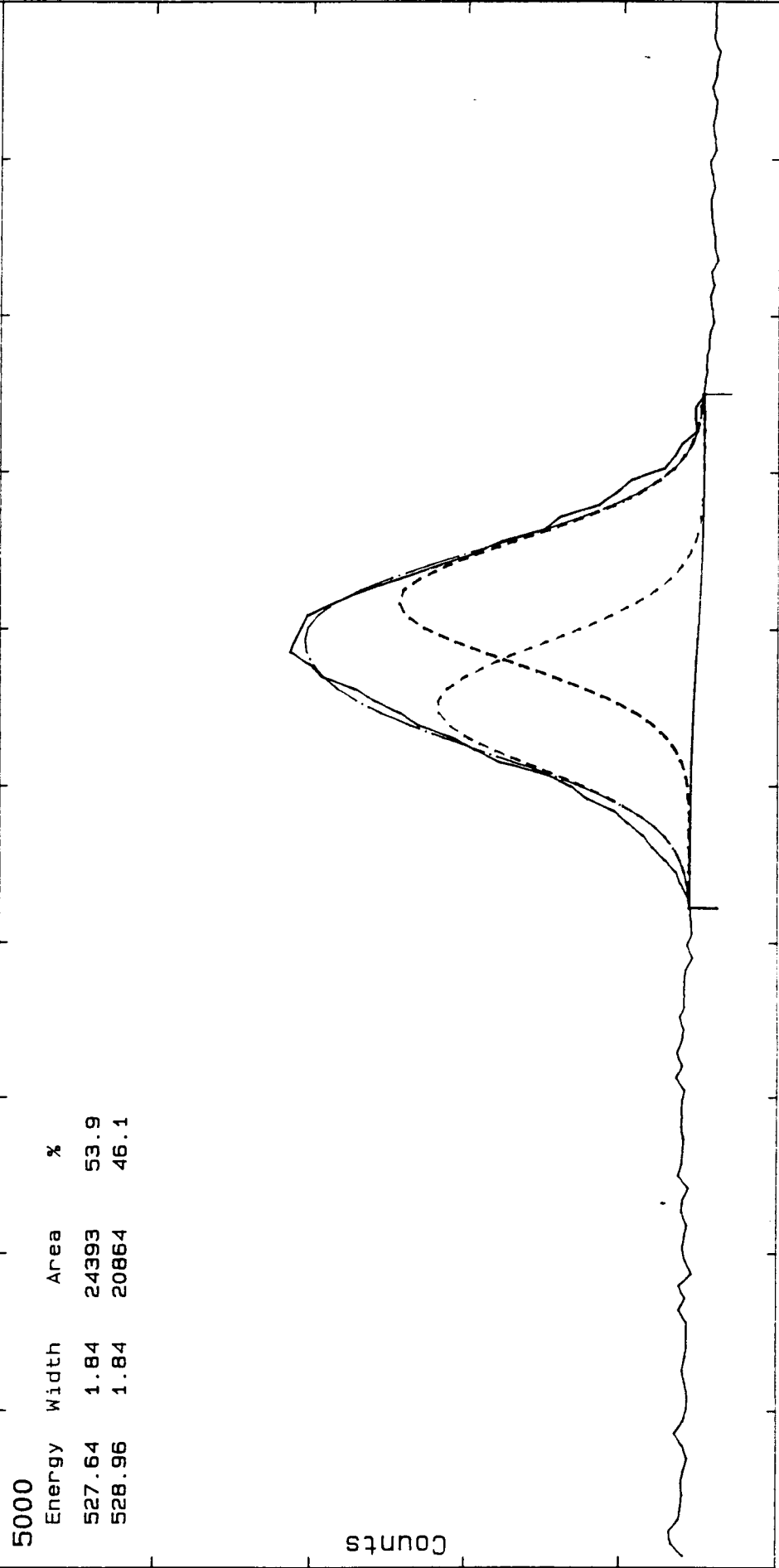
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Region 3	Disc: NASA01	# of Scans: 15	Resolution: 2

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 60 W, 95 MIN., CHARGE NEUTRALIZATION SCREEN

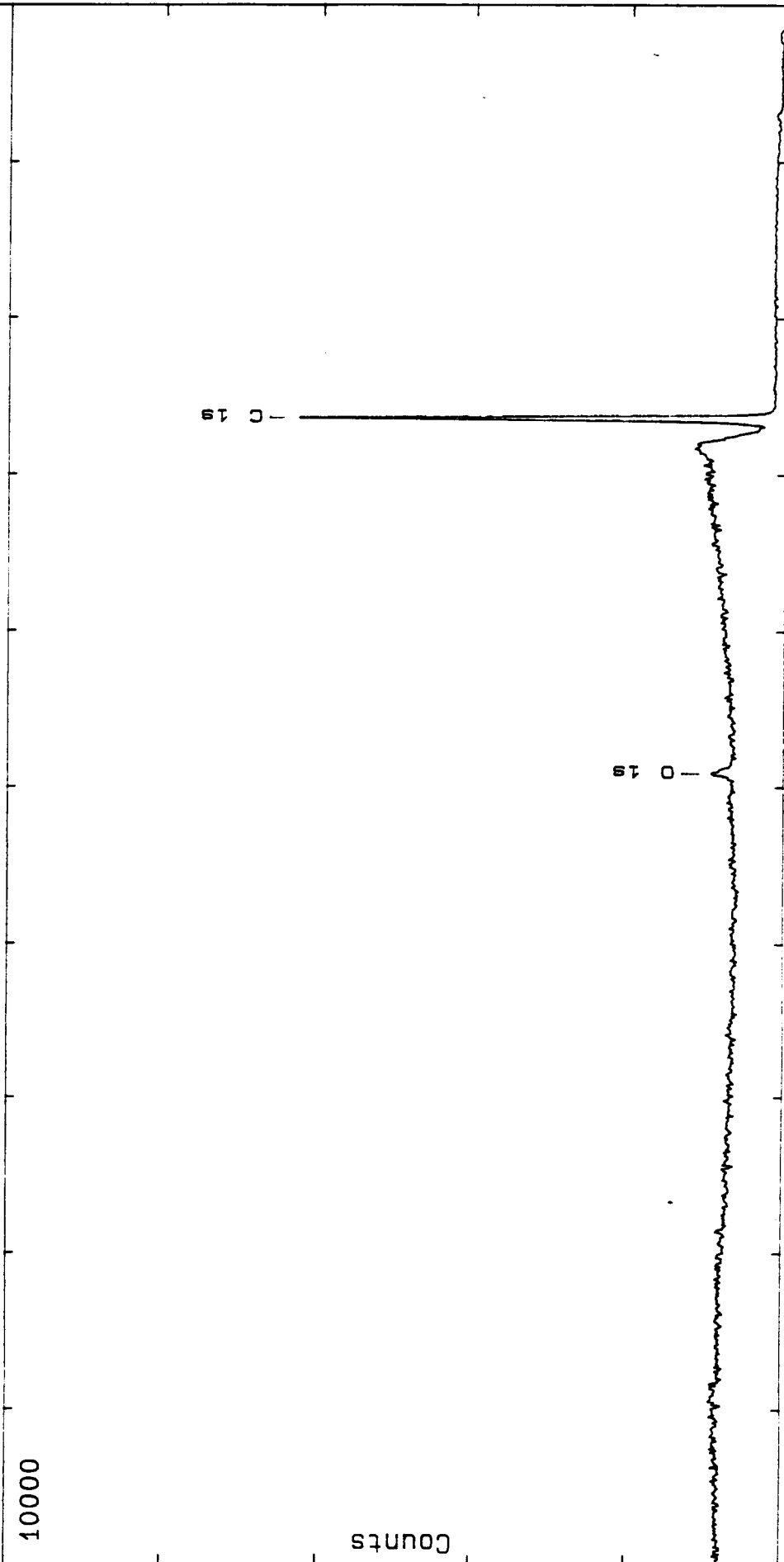


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Region 4	Disc: NASA01	# of Scans: 10	Resolution: 2

Description: KAPTON-6, 0 1s SPECTRUM, PLASMA EXPOSED: 45 DEG C, Operator: WBC
60 W, 95 MIN., CHARGE NEUTRALIZATION SCREEN



File: HDPE10	Date: 8/15/1988	Spot Size: 1000 u	Flood Gun: 2.0 eV
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Operator: WBC			

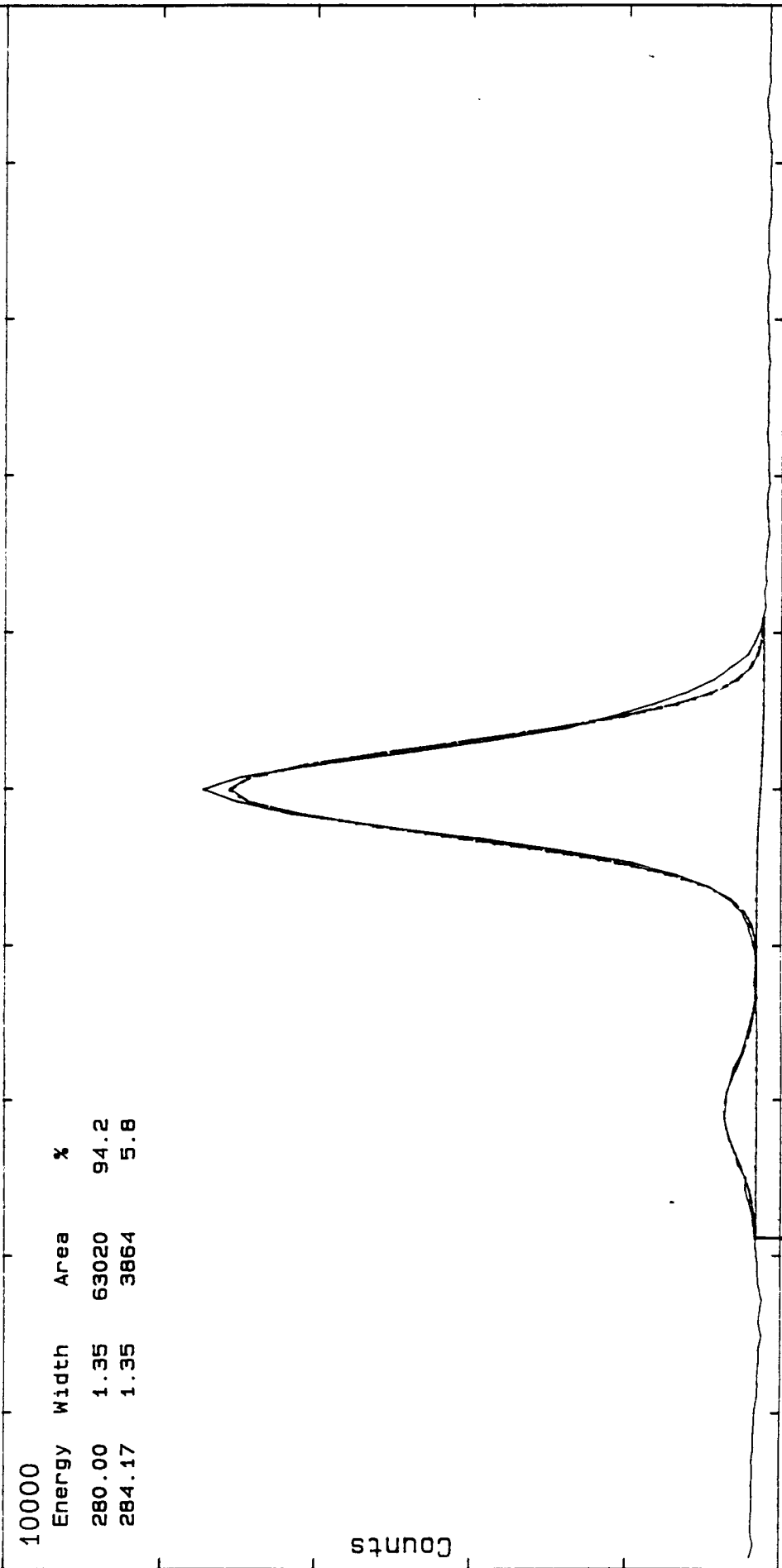


1090.0 Binding Energy (eV) -10.0

Report #: MSFC-01

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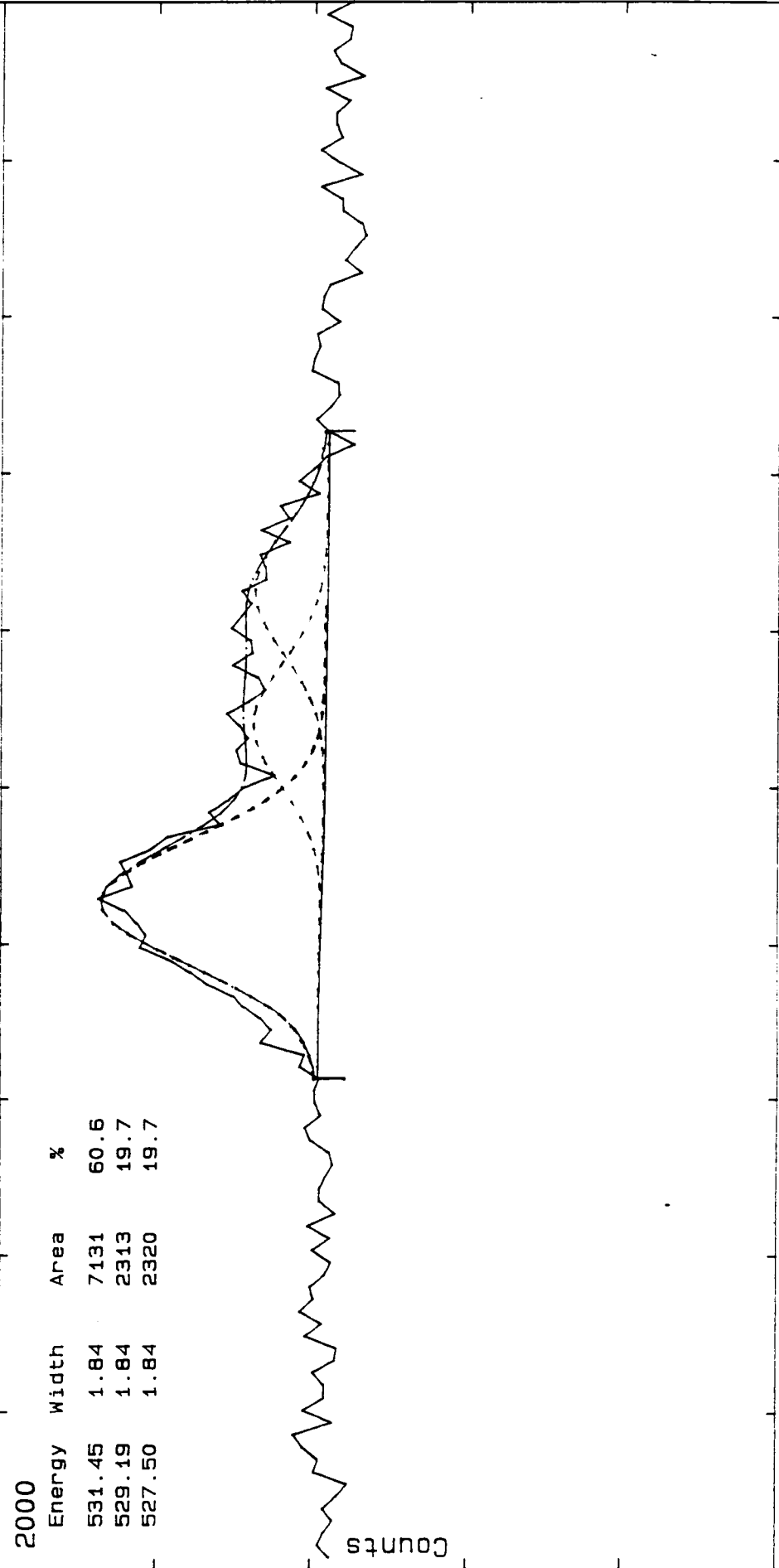
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 CHARGE NEUTRALIZATION SCREEN
 Operator: WBC



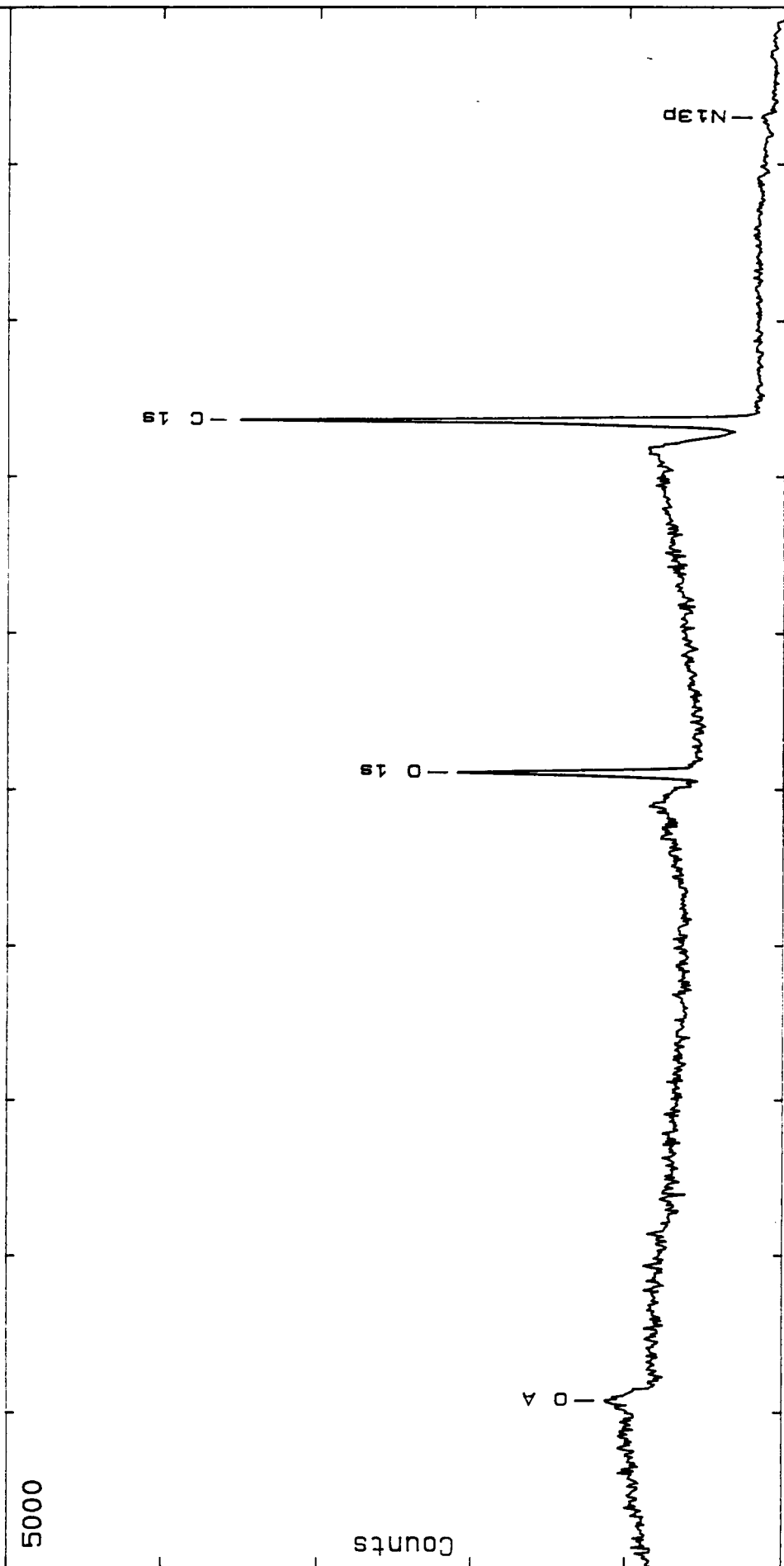
290.0 Binding Energy (eV) 270.0

File: HDPEMRS11	Date: 8/15/1988	Spot Size: 300 u	Flood Gun: 2.0 eV
Region 2	Disc: NASA01	# of Scans: 30	Resolution: 2

Description: HDPE-19 (CONTROL), 0 1s SPECTRUM
 CHARGE NEUTRALIZATION SCREEN



File: HDPE12	Date: 8/15/1988	Spot Size: 1000 u	Flood Gun: 2.0 eV
	Disc: NASA01	# of Scans: 1	Resolution: 4
Description: HDPE-20, PLASMA EXPOSED: 45 DEG C, 60 W, 30 MIN. Operator: WBC			
CHARGE NEUTRALIZATION SCREEN			



1090.0

5000

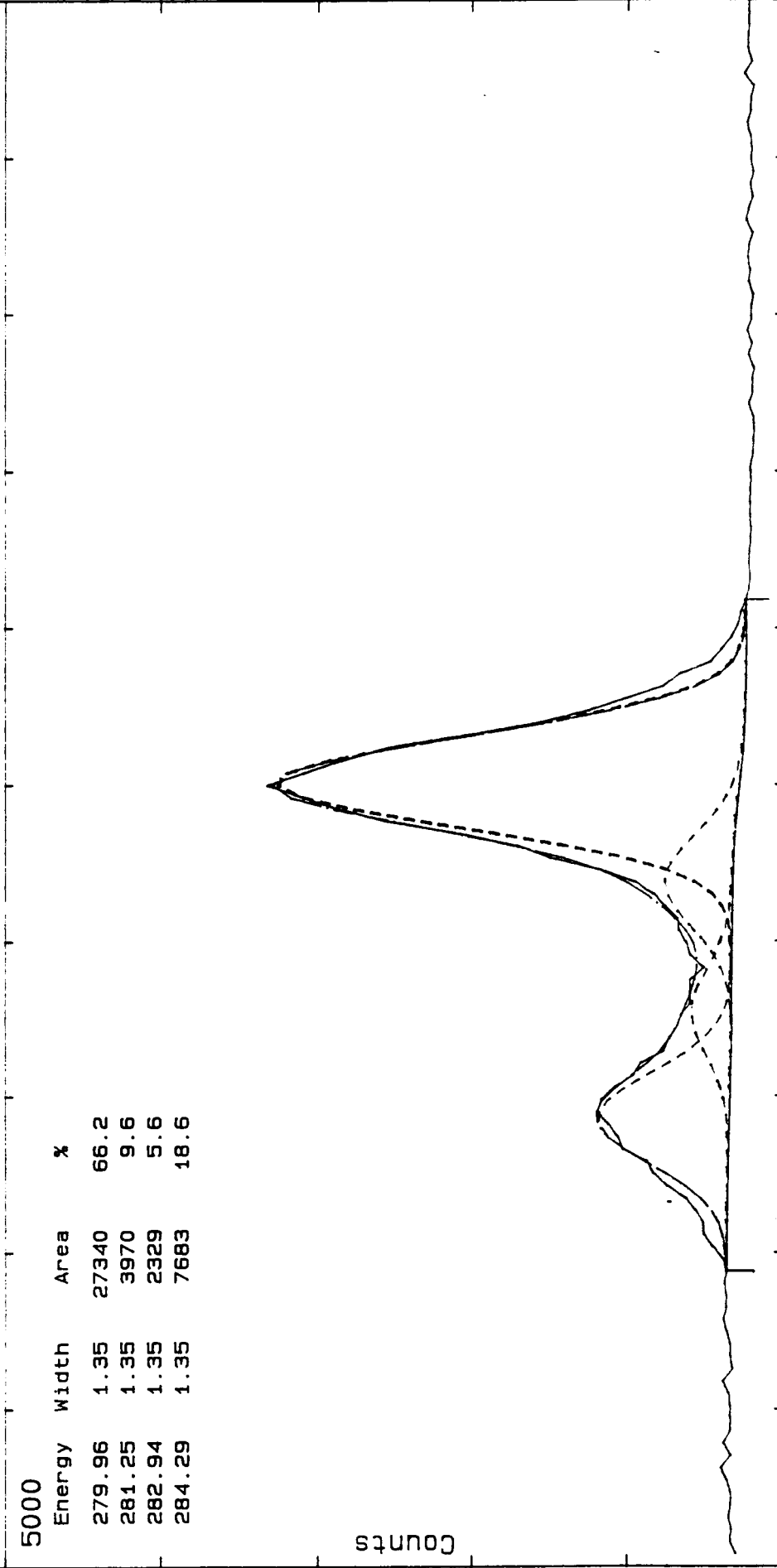
Counts

Binding Energy (eV)

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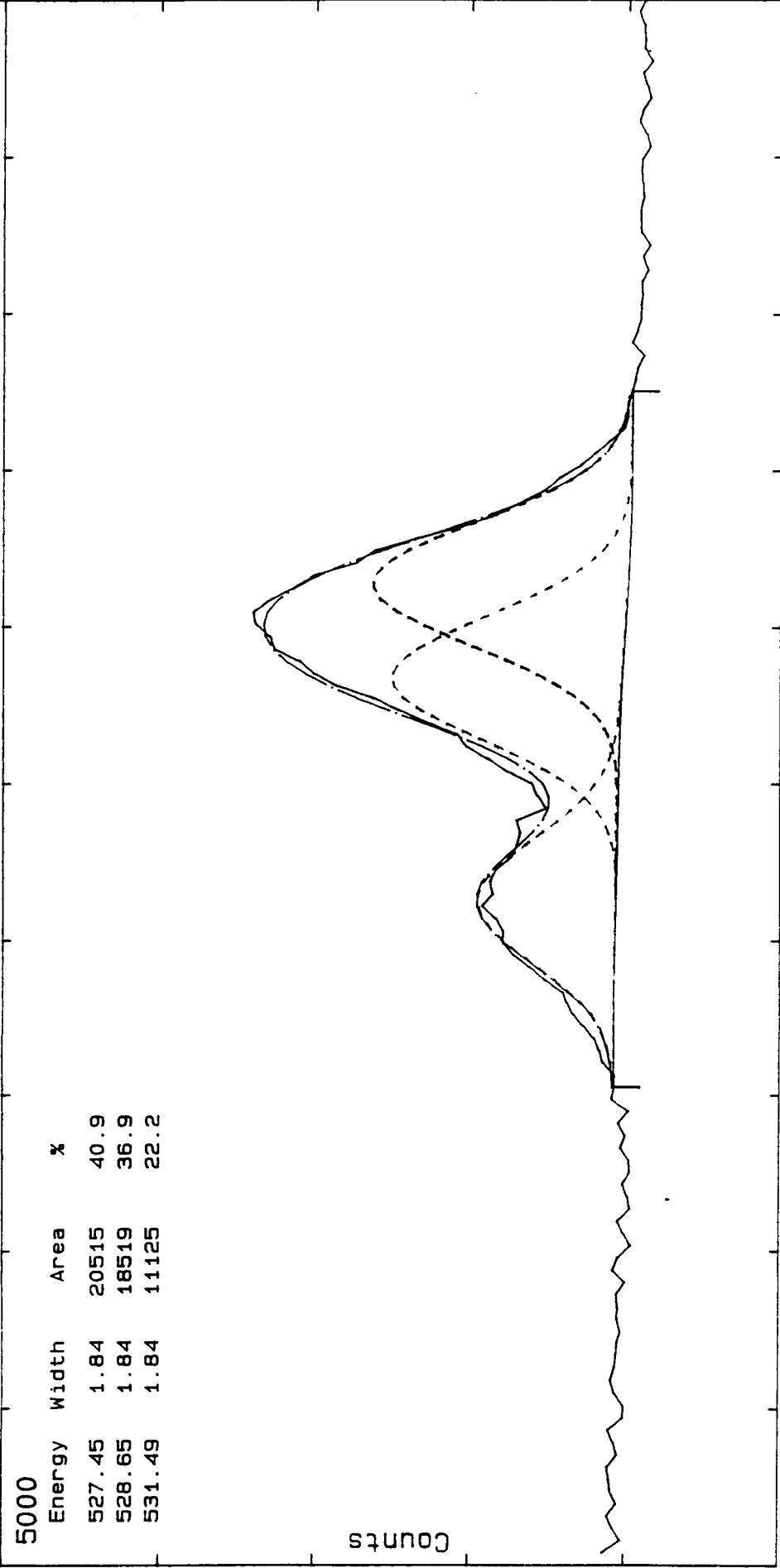
Report #: MSFC-01

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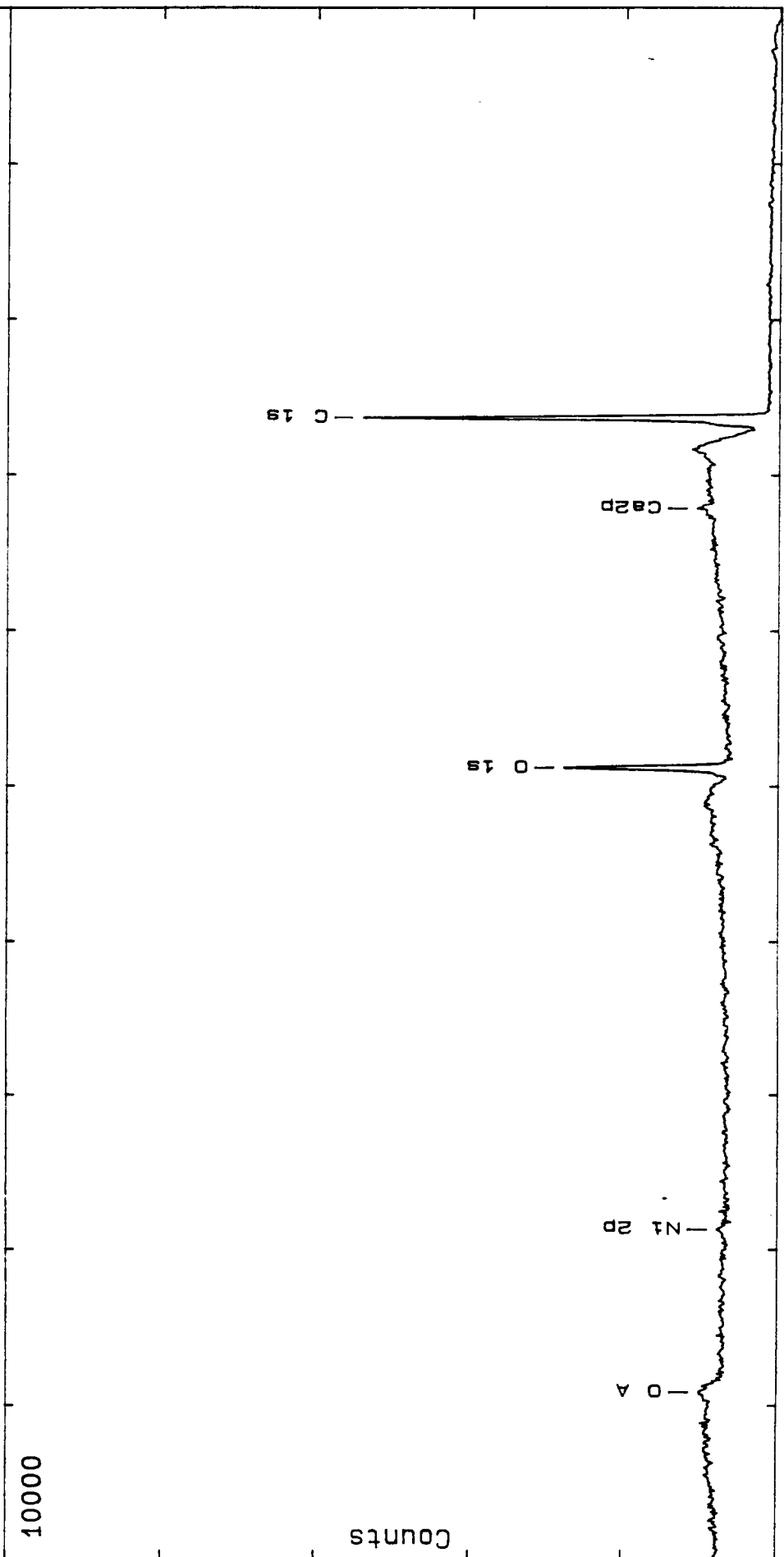


File: HDPEMRS13	Date: 8/15/1988	Spot Size: 300 u	Flood Gun: 2.0 eV
Region 2	Disc: NASA01	# of Scans: 30	Resolution: 2

Description: HDPE-20, 0 1s SPECTRUM, PLASMA EXPOSED: 45 DEG C, Operator: WBC
60 W, 30 MIN.: CHARGE NEUTRALIZATION SCREEN



File: HDPE14	Date: 8/15/1988	Spot Size: 1000 u	Flood Gun: 3.0 eV
	Disc: NASA01	# of Scans: 1	Resolution: 4
Description: HDPE-21, PLASMA EXPOSED: 45 DEG C, 60 W, 95 MIN. Operator: WBC			
CHARGE NEUTRALIZATION SCREEN			



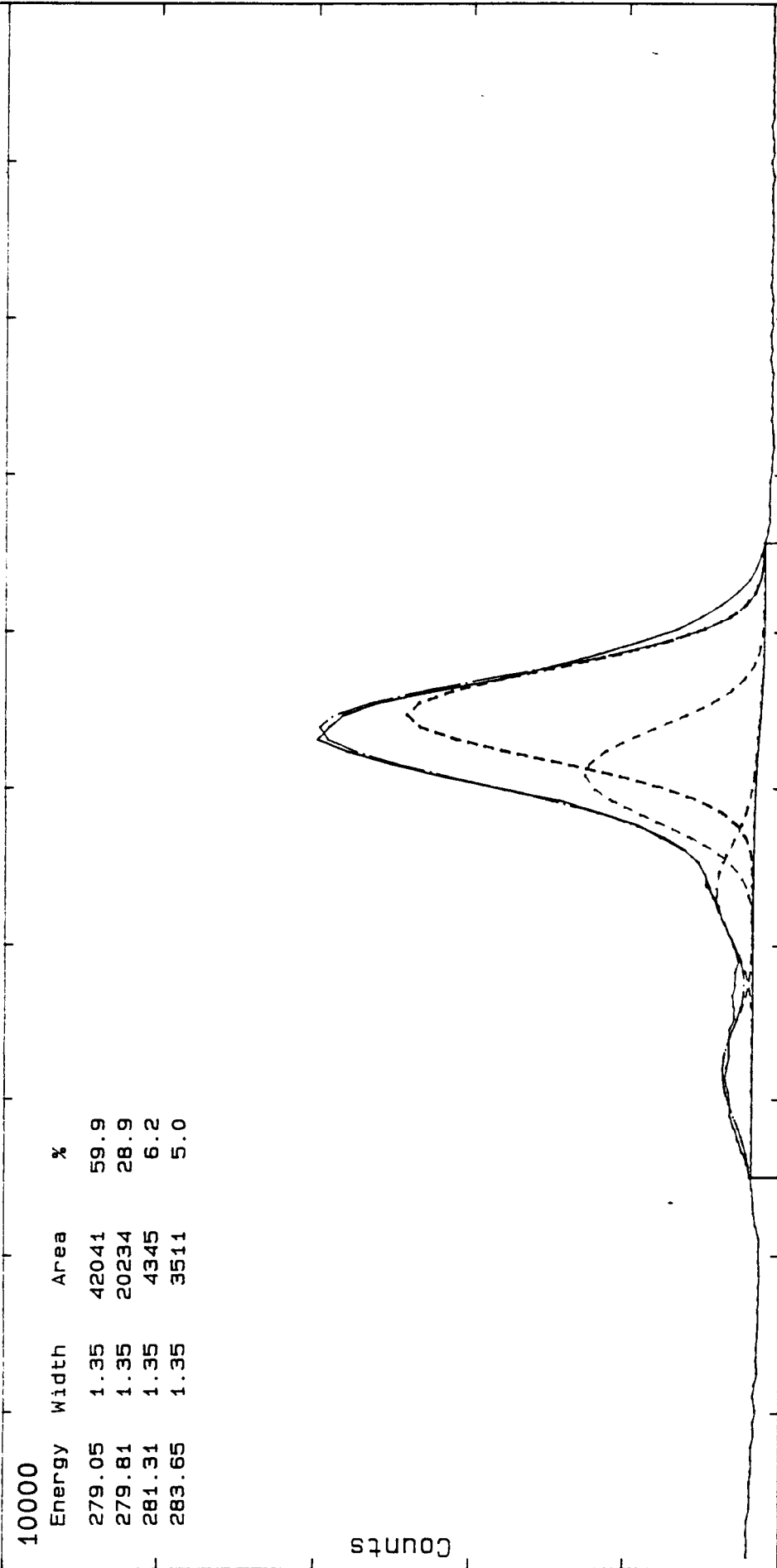
1090.0

Binding Energy (eV)

-10.0

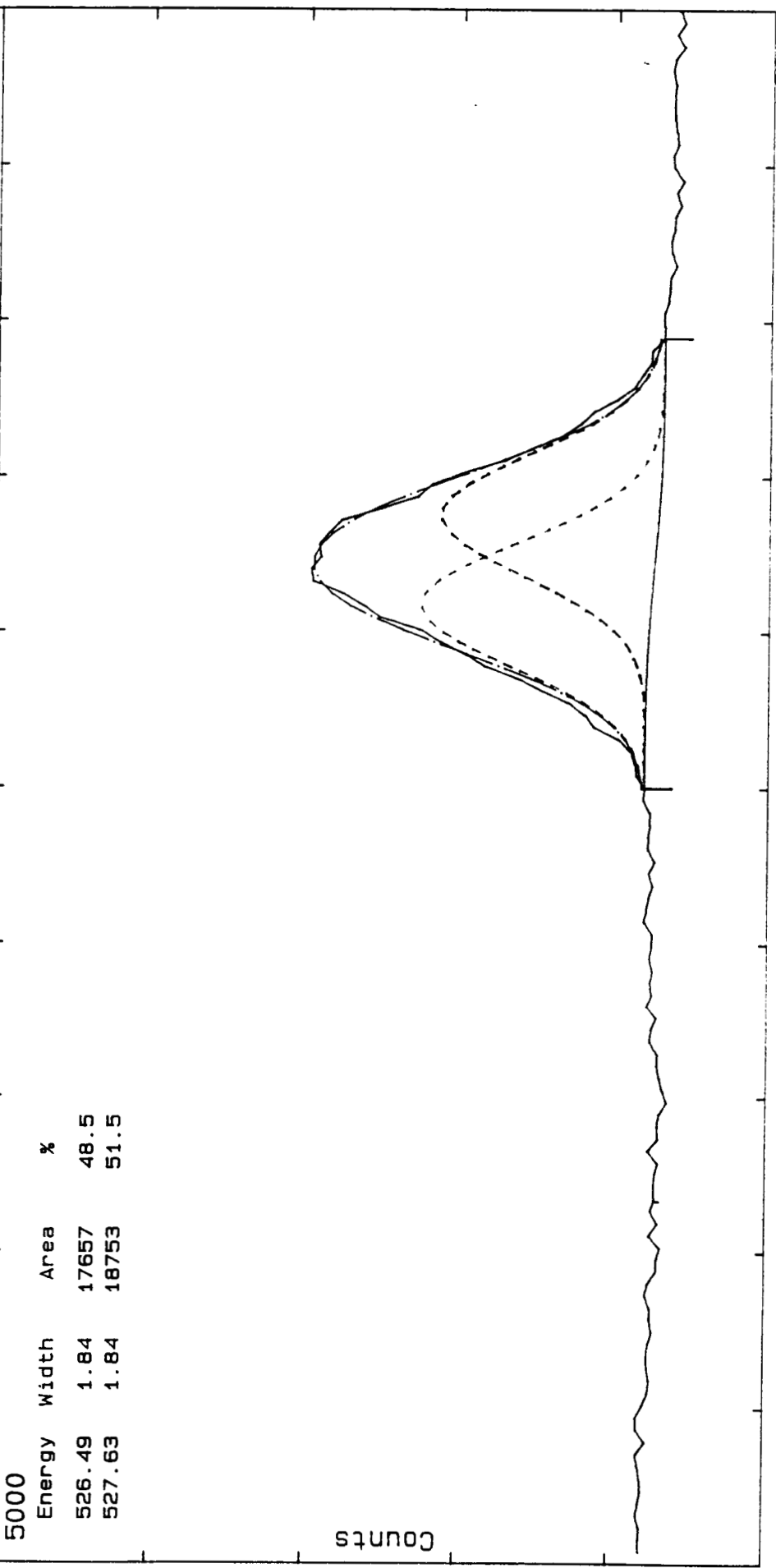
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File: HDPEMRS15	Date: 8/15/1988	Spot Size: 300 u	Flood Gun: 3.0 eV
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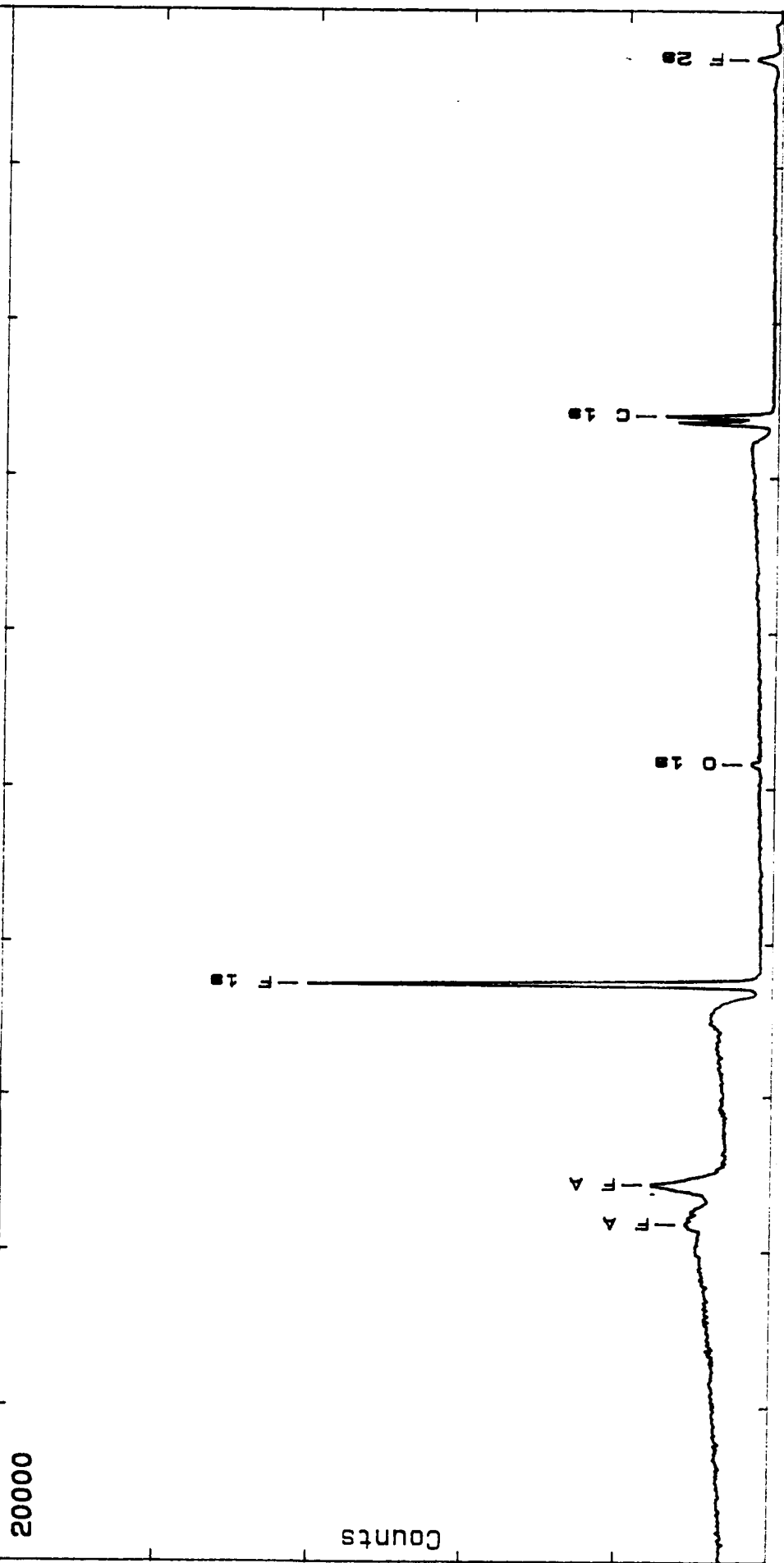


File: HDPEMRS15	Date: 8/15/1988	Spot Size: 300 u	Flood Gun: 3.0 eV
Region 2	Disc: NASA01	# of Scans: 15	Resolution: 2

Description: HDPE-21, 0 1s SPECTRUM, PLASMA EXPOSED: 45 DEG C, Operator: WBC
 60 W, 95 MIN.; CHARGE NEUTRALIZATION SCREEN



File: PVDFMRS08	Date: 8/17/1988	Spot Size: 1000 u	Flood Gun: 7.0 eV
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Operator: WBC			
20000			

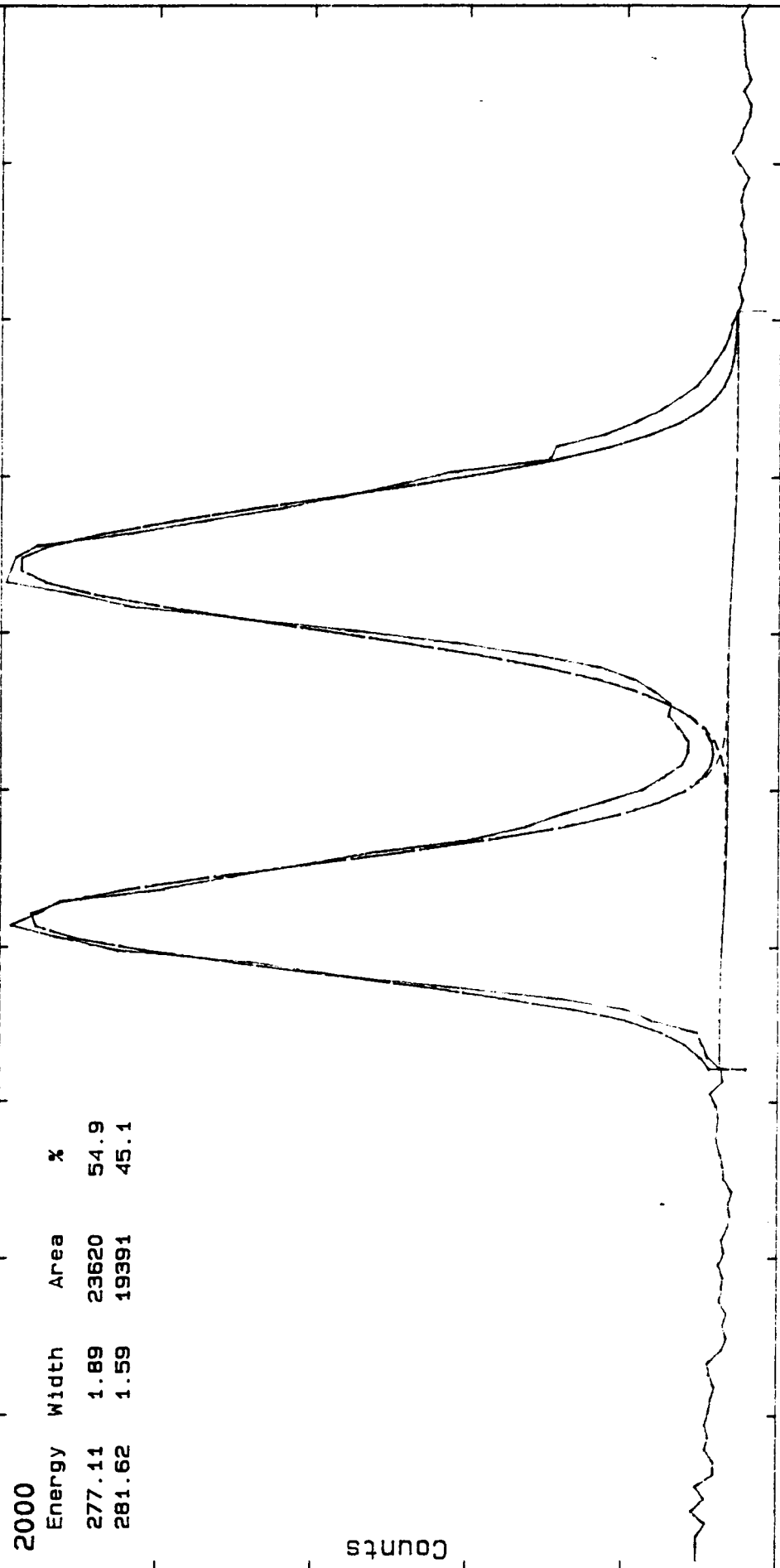


1090.0 Binding Energy (eV) -10.0

Report #: MSFC-01

File: PVDFMRS08	Date: 8/17/1988	Spot Size: 300 μ	Flood Gun: 7.0 eV
Region 2	Disc: NASA01	# of Scans: 10	Resolution: 2

Description: PVDF-4 (CONTROL), C 1s SPECTRUM
CHARGE NEUTRALIZATION SCREEN



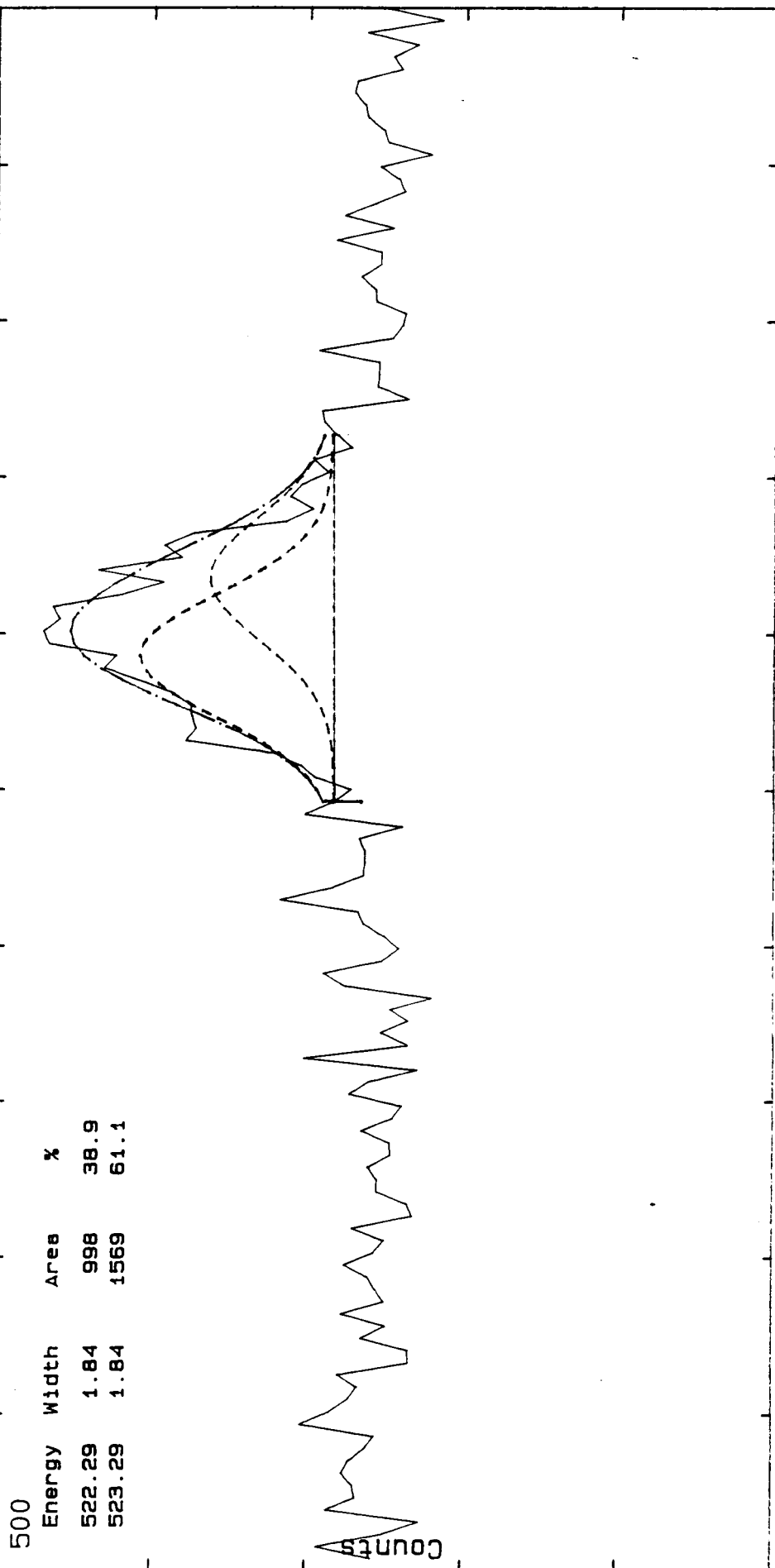
290.0

Binding Energy (eV)

270.0

Report #: MSFC-01

File: PVDFMRS08	Date: 8/17/1988	Spot Size: 300 u	Flood Gun: 7.0 eV
Region 3	Disc: NASA01	# of Scans: 10	Resolution: 2
Description: PVDF-4 (CONTROL), 0 1s SPECTRUM CHARGE NEUTRALIZATION SCREEN		Operator: WBC	



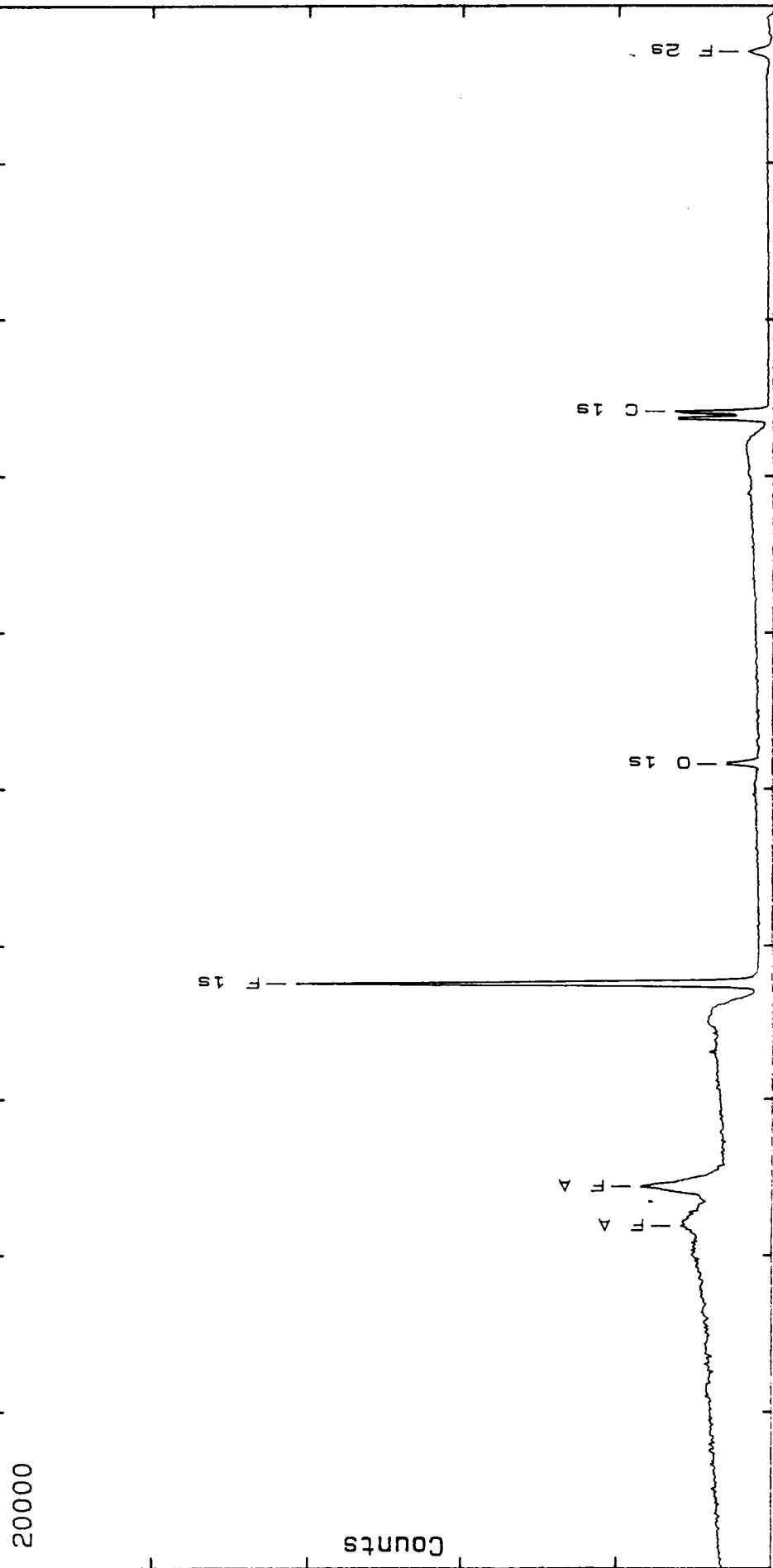
535.0

Binding Energy (eV)

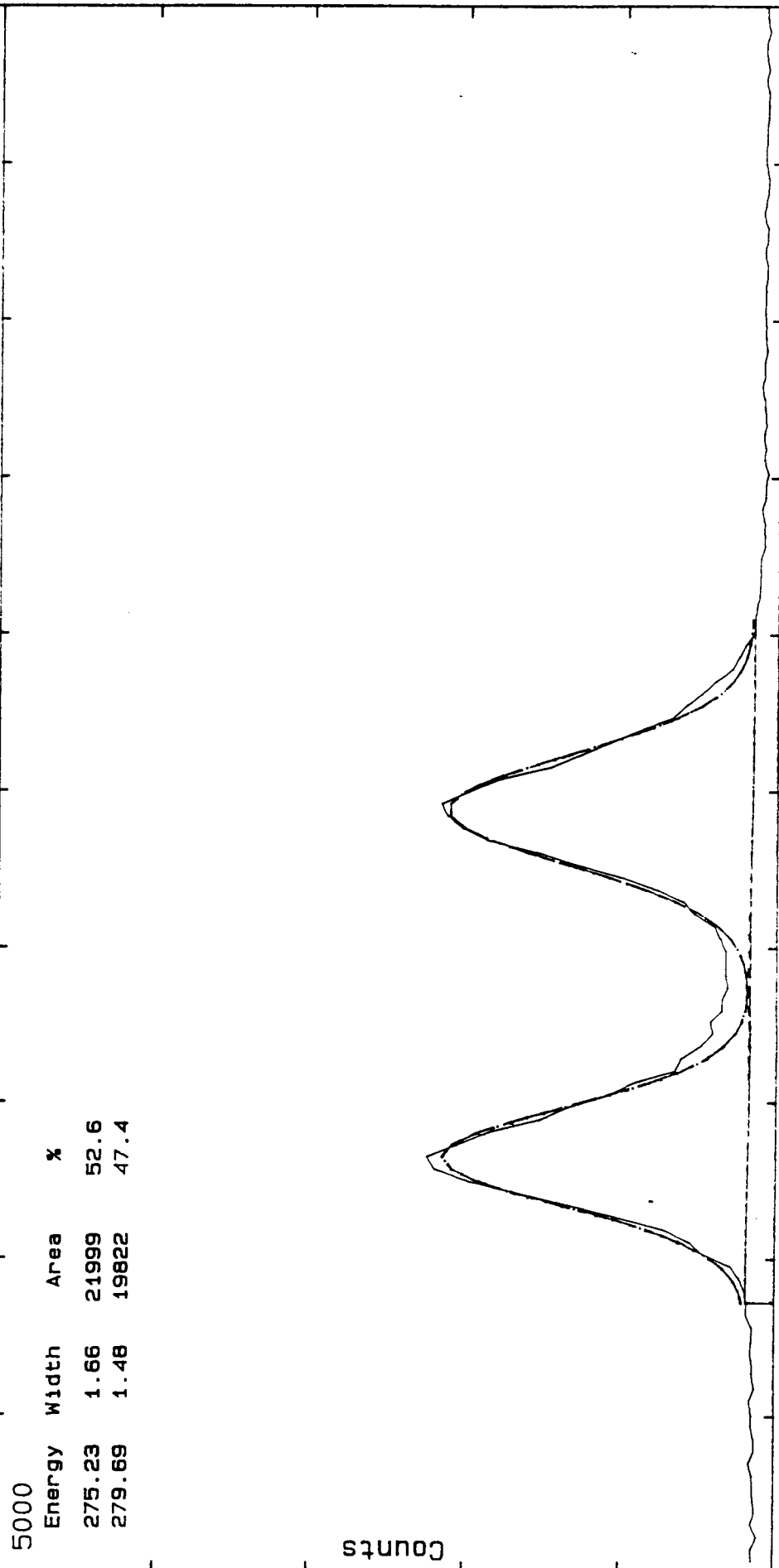
515.0

Report #: MSFC-01

File: PVDFMRS09	Date: 8/18/1988	Spot Size: 1000 u	Flood Gun: 9.0 eV
Region 1	Disc: NASA01	# of Scans: 1	Resolution: 4
Description: PVDF-5, PLASMA EXPOSED: 45 DEG C, 60 W, 30 MIN. Operator: WBC CHARGE NEUTRALIZATION SCREEN			

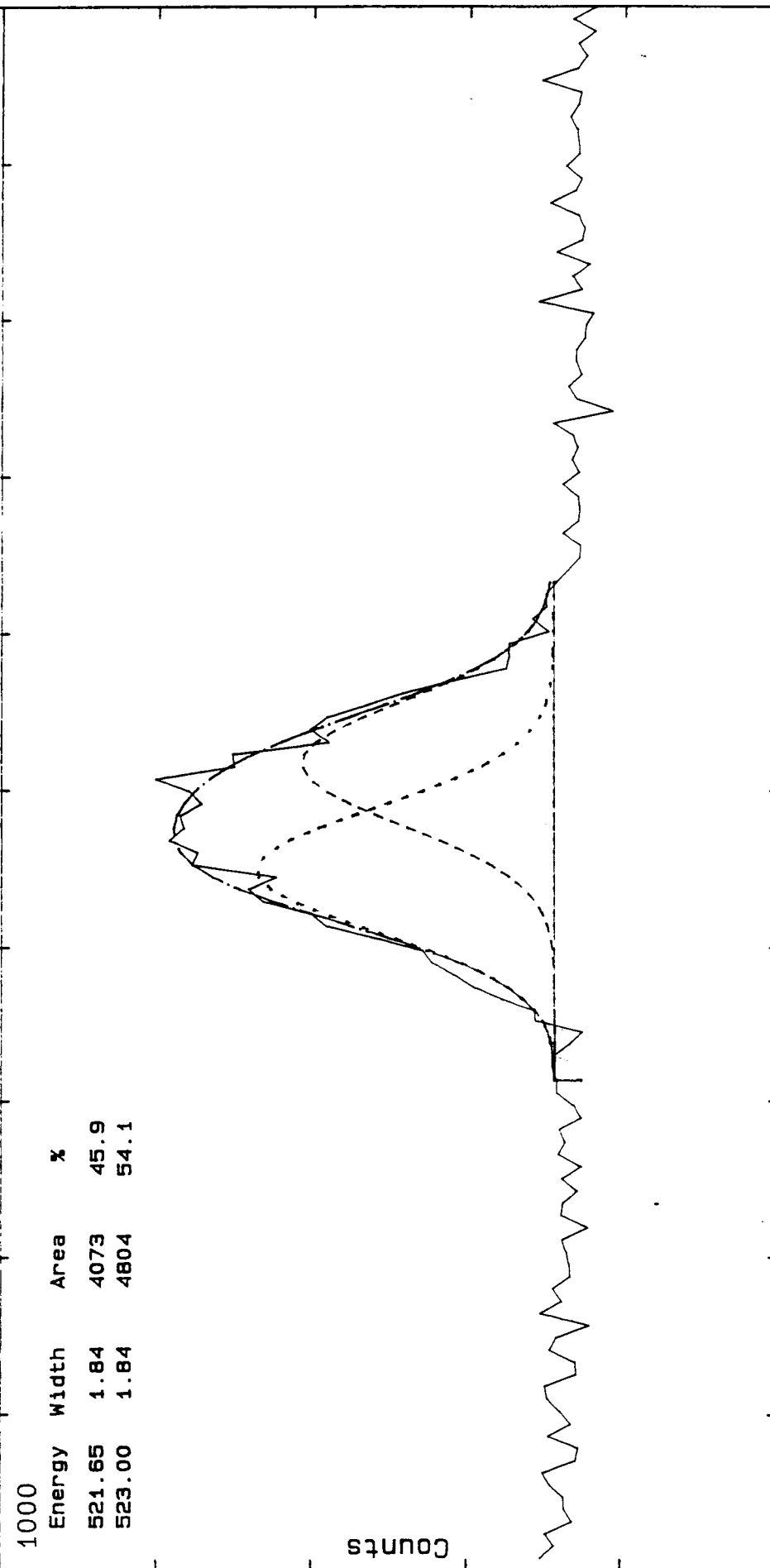


File: PVDFMRS09	Date: 8/18/1988	Spot Size: 300 u	Flood Gun: 9.0 eV
Region 2	Disc: NASA01	# of Scans: 10	Resolution: 2
Description: PVDF-5, C 1s SPECTRUM, PLASMA EXPOSED: 45 DEG C, WBC 60 W, 30 MIN., CHARGE NEUTRALIZATION SCREEN			

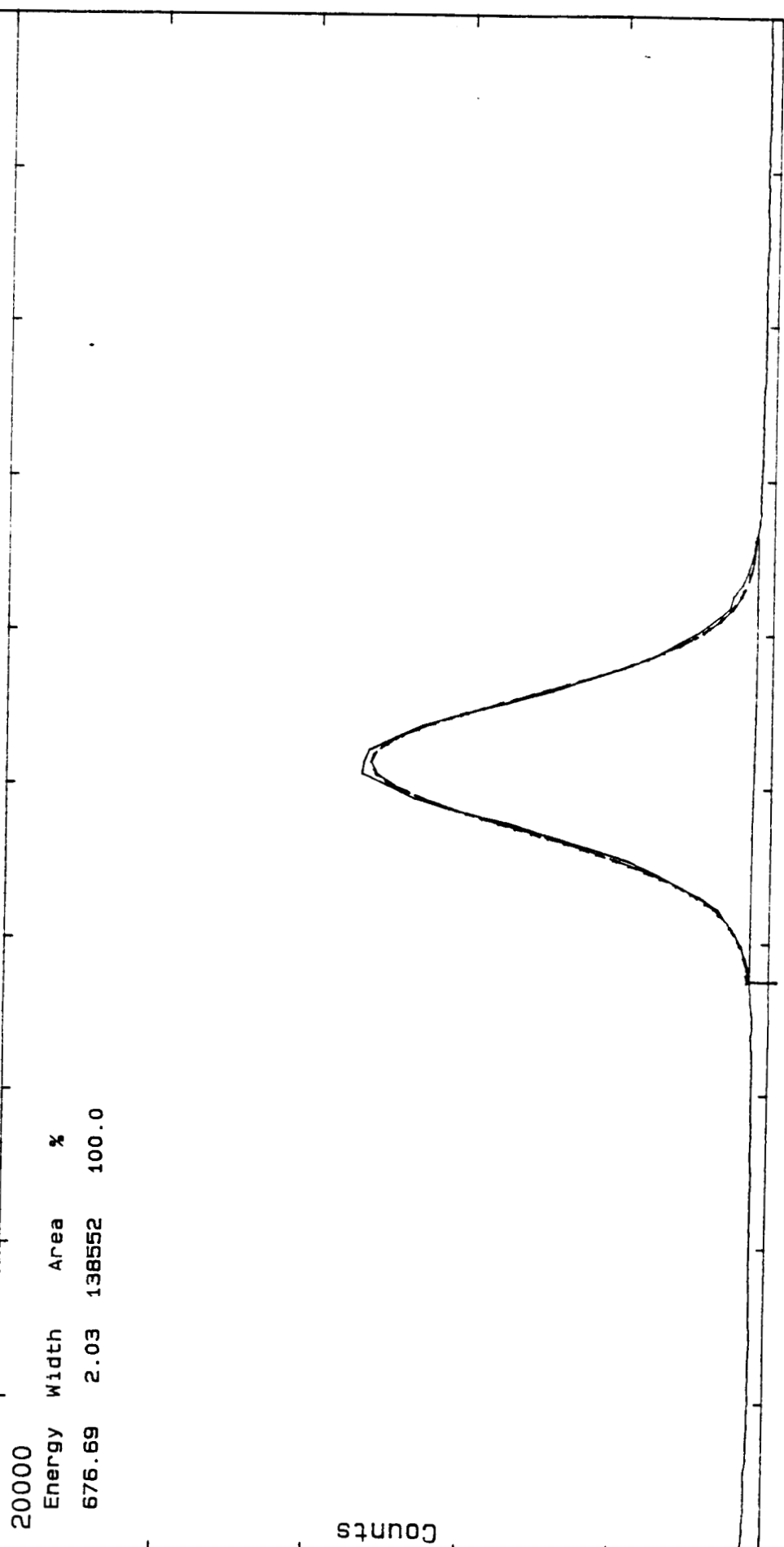


File: PVDFMRS09	Date: 8/18/1988	Spot Size: 300 u	Flood Gun: 9.0 eV
Region 3	Disc: NASA01	# of Scans: 10	Resolution: 2

Description: PVDF-5, 0 1s SPECTRUM, PLASMA EXPOSED: 45 DEG C, Operator: WBC
 60 W, 30 MIN., CHARGE NEUTRALIZATION SCREEN

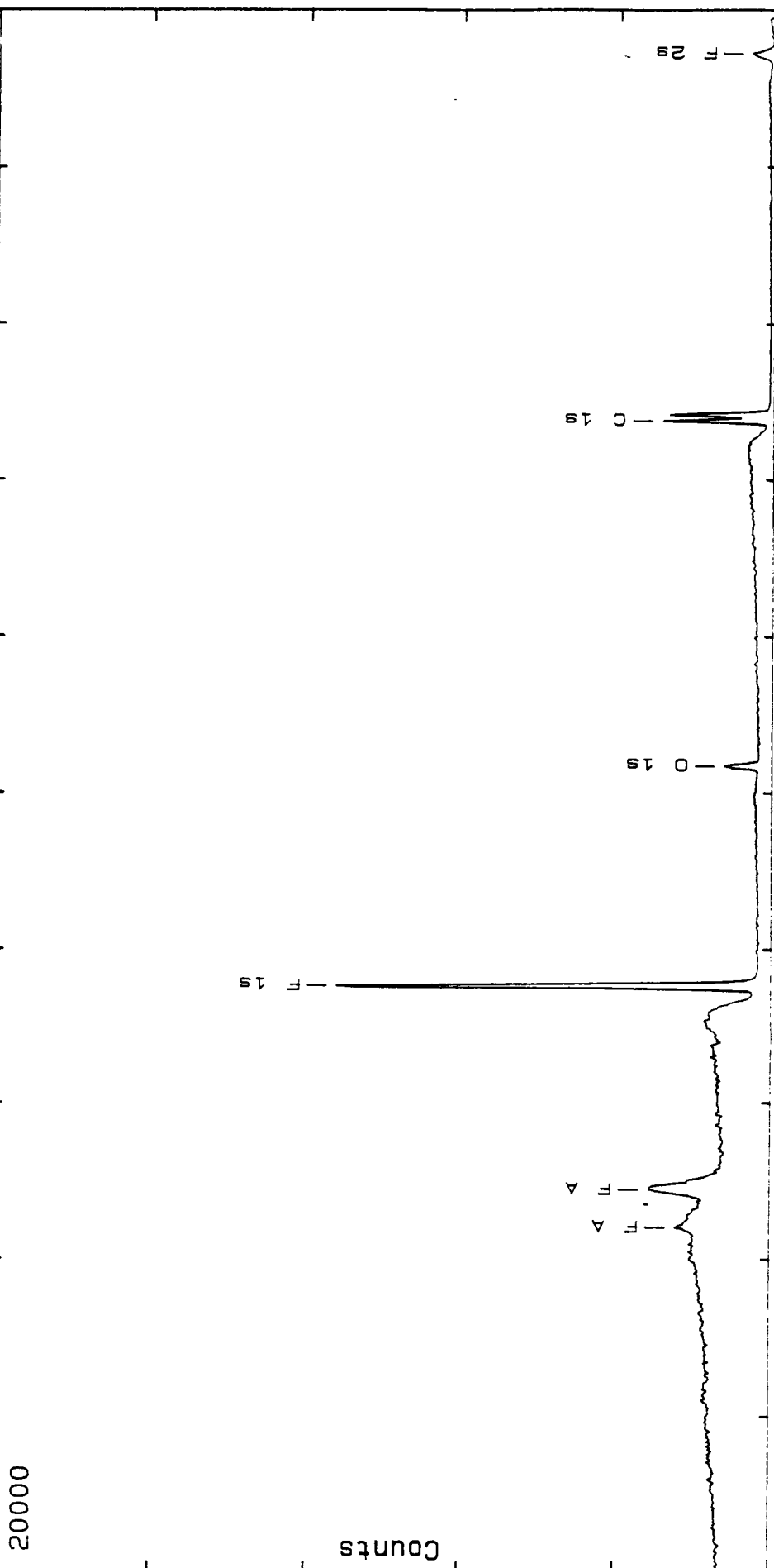


File: PVDFMRS09	Date: 8/18/1988	Spot Size: 300 u	Flood Gun: 9.0 eV
Region 4	Disc: NASA01	# of Scans: 10	Resolution: 2
Description: PVDF-5, F 1s SPECTRUM, PLASMA EXPOSED: 45 DEG C, Operator: WBC 60 W, 30 MIN., CHARGE NEUTRALIZATION SCREEN			

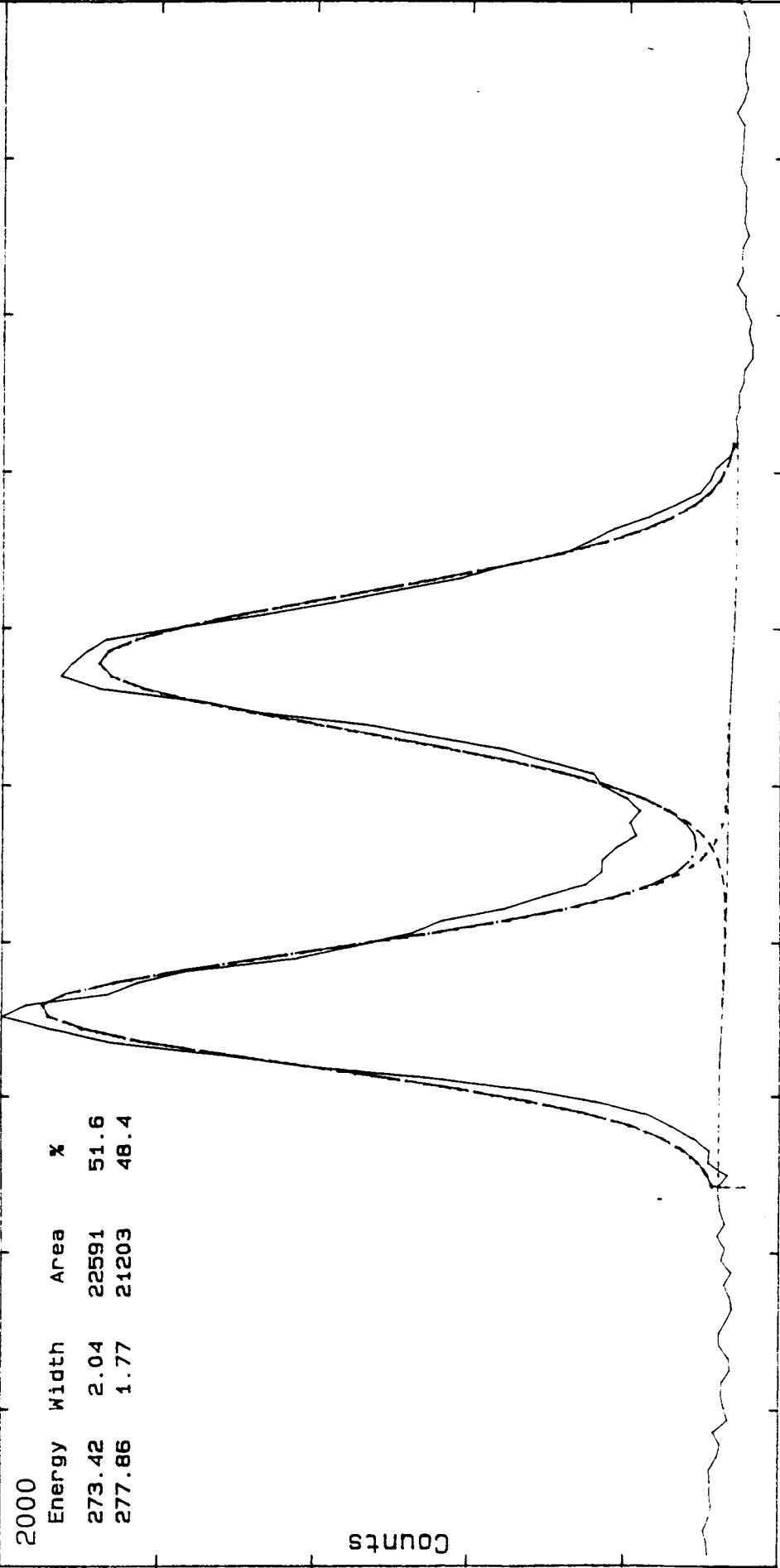


Energy	Width	Area	%
676.69	2.03	138552	100.0

File: PVDFMRS10	Date: 8/18/1988	Spot Size: 1000 u	Flood Gun: 11.0 eV
Region 1	Disc: NASA01	# of Scans: 1	Resolution: 4
Description: PVDF-6, PLASMA EXPOSED: 45 DEG C, 60 W, 95 MIN. Operator: WBC			
CHARGE NEUTRALIZATION SCREEN			

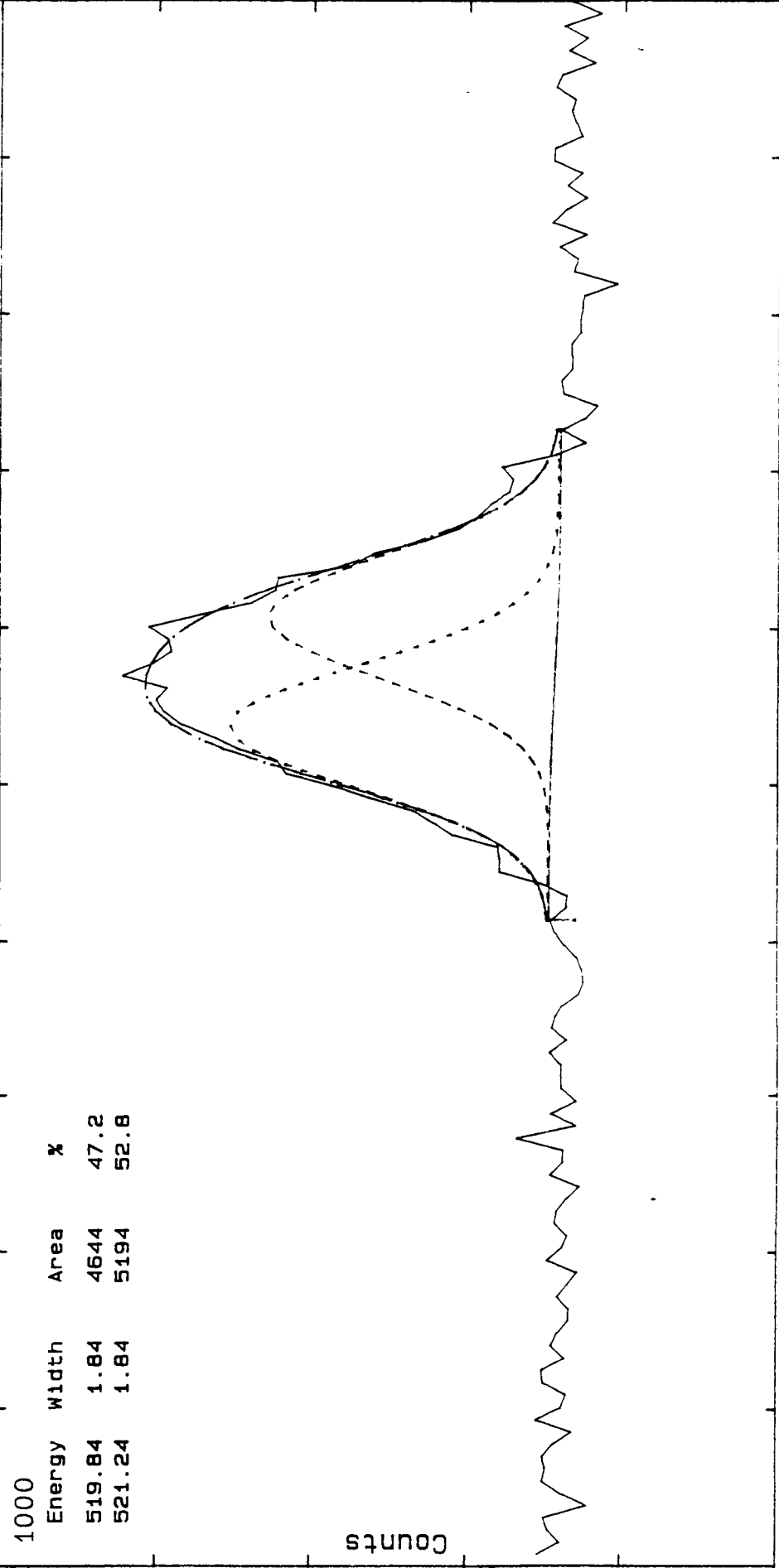


File: PVDFMRS10	Date: 8/18/1988	Spot Size: 300 u	Flood Gun: 11.0 eV
Region 2	Disc: NASA01	# of Scans: 10	Resolution: 2
Description: PVDF-6, C 1s SPECTRUM, PLASMA EXPOSED: 45 DEG C, WBC 60 W, 95 MIN., CHARGE NEUTRALIZATION SCREEN			

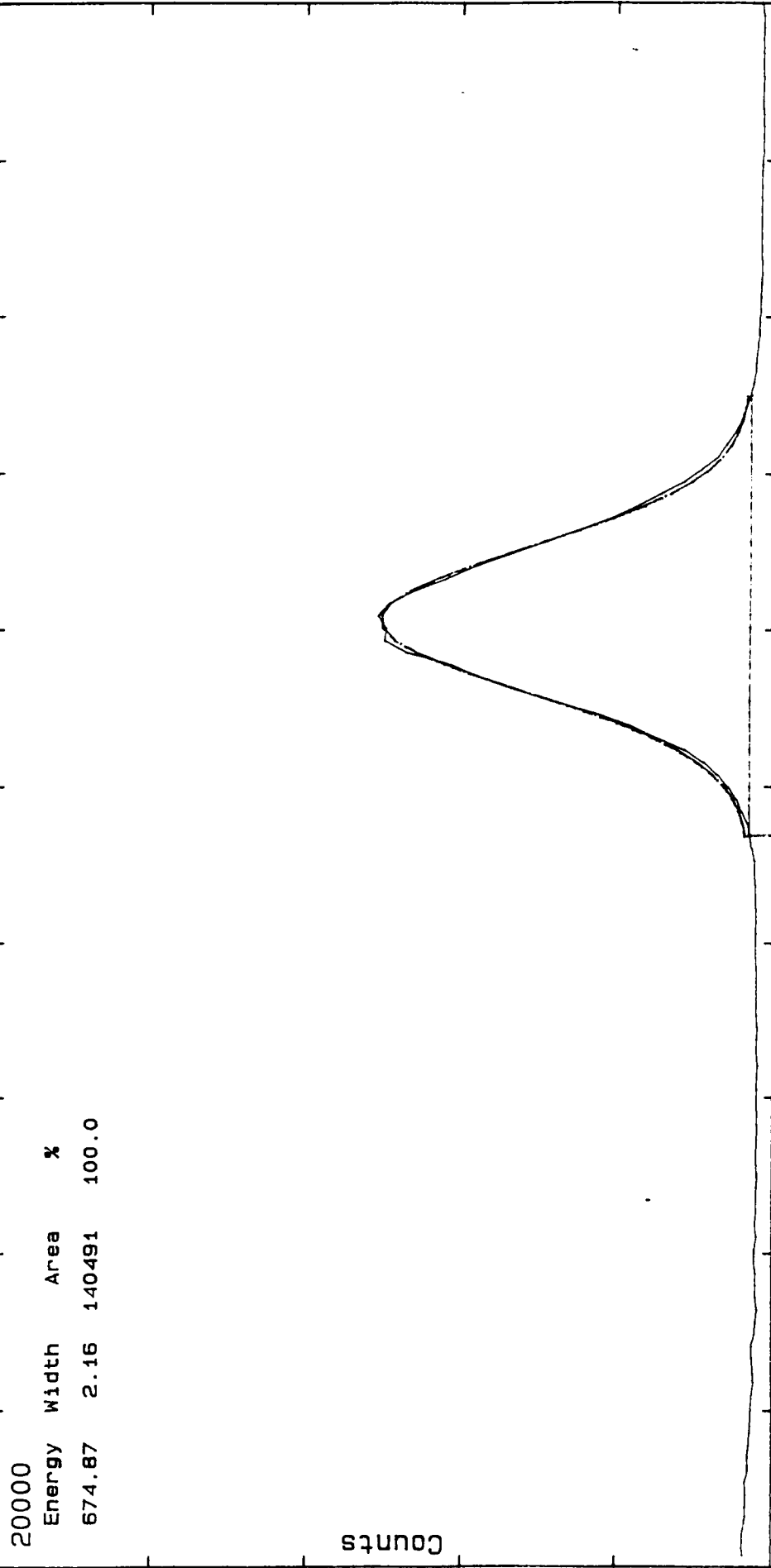


File: PVDFMRS10	Date: 8/18/1988	Spot Size: 300 μ	Flood Gun: 11.0 eV
Region 3	Disc: NASA01	# of Scans: 10	Resolution: 2

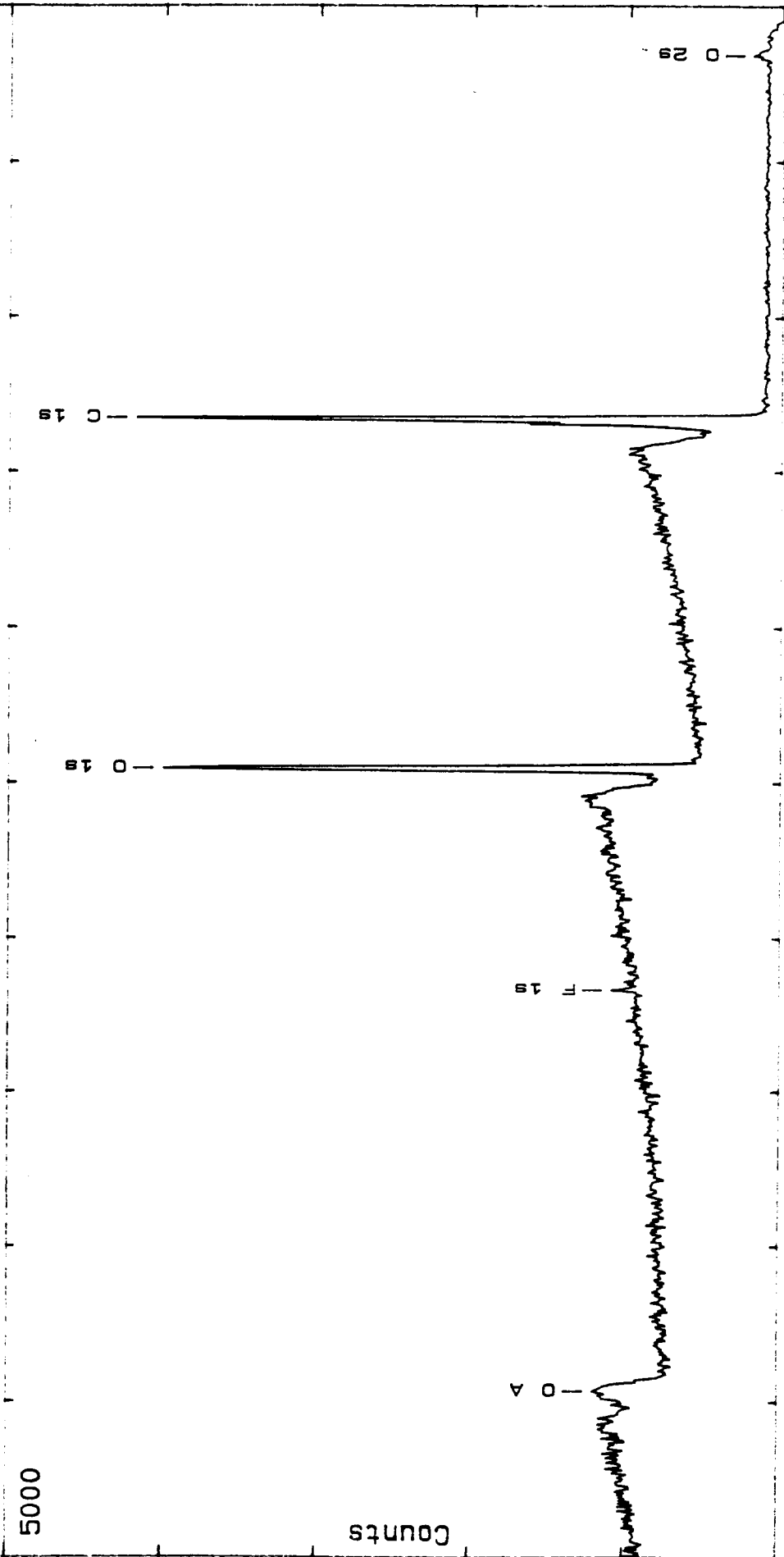
Description: PVDF-6, 0 1s SPECTRUM, PLASMA EXPOSED: 45 DEG C, Operator: WBC
 60 W, 95 MIN., CHARGE NEUTRALIZATION SCREEN



File: PVDFMRS10	Date: 8/18/1988	Spot Size: 300 u	Flood Gun: 11.0 eV
Region 4	Disc: NASA01	# of Scans: 10	Resolution: 2
Description: PVDF-6, F 1s SPECTRUM, PLASMA EXPOSED: 45 DEG C, Operator: WBC 60 W, 95 MIN., CHARGE NEUTRALIZATION SCREEN			



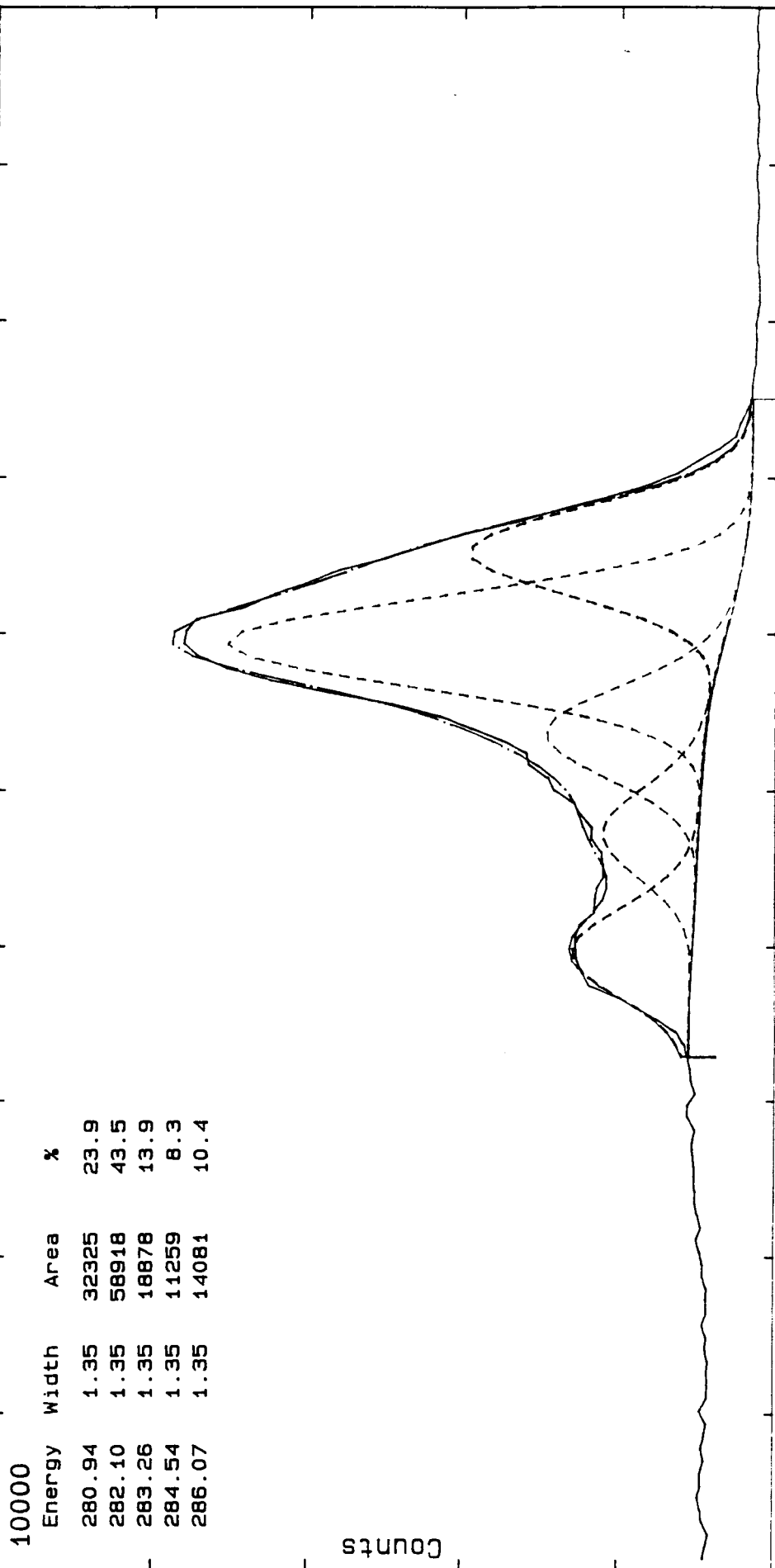
File: MYLAR01	Date: 8/25/1988	Spot Size: 1000 u	Flood Gun: 1.0 eV
Description: MYLAR CONTROL CHARGE NEUTRALIZATION SCREEN	Disc: NASA02	# of Scans: 1	Resolution: 4 Operator: WBC



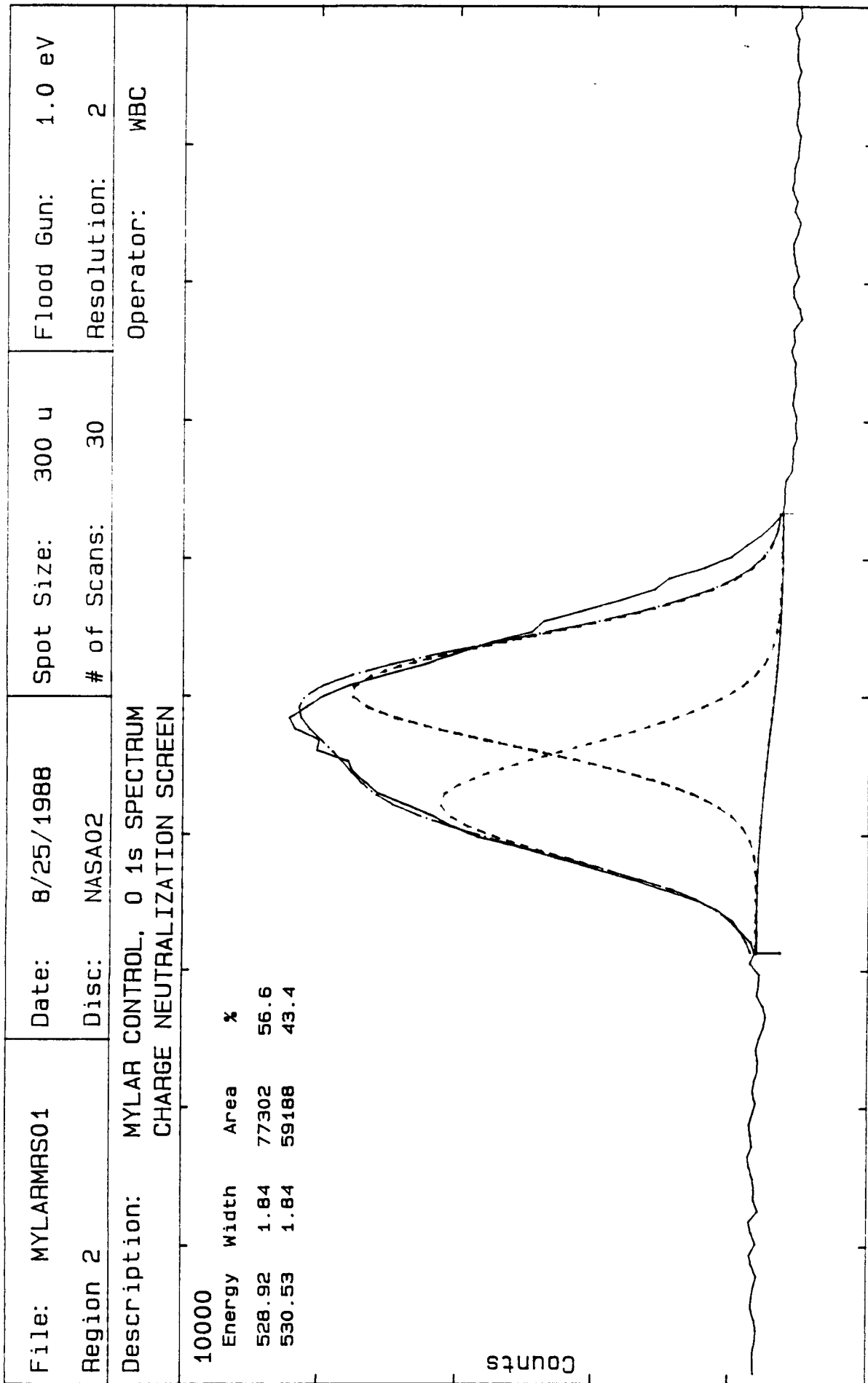
File: MYLARMRS01	Date: 8/25/1988	Spot Size: 300 u	Flood Gun: 1.0 eV
Region 1	Disc: NASA02	# of Scans: 30	Resolution: 2

Description: MYLAR CONTROL, C 1s SPECTRUM
CHARGE NEUTRALIZATION SCREEN

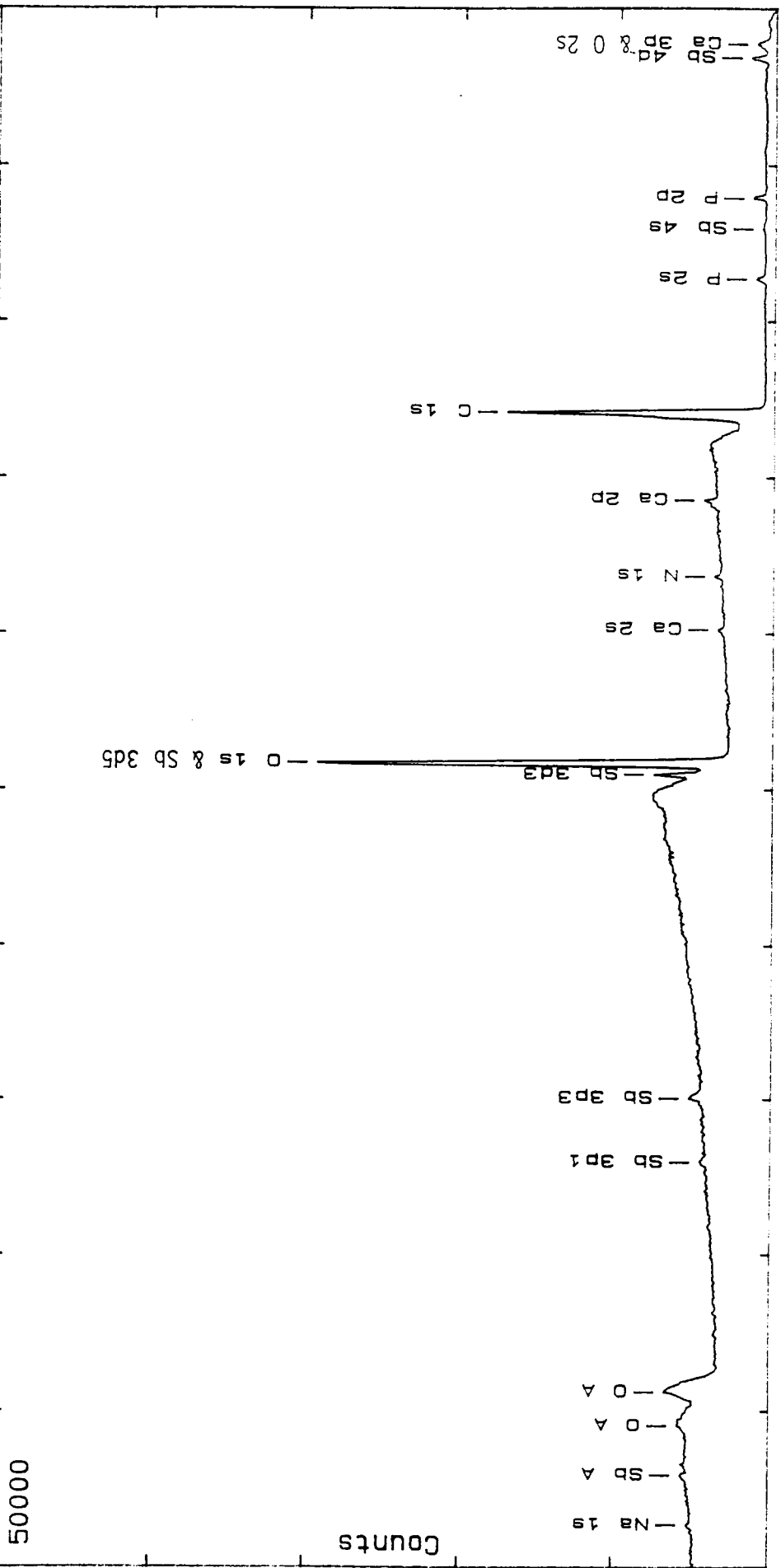
Operator: WBC



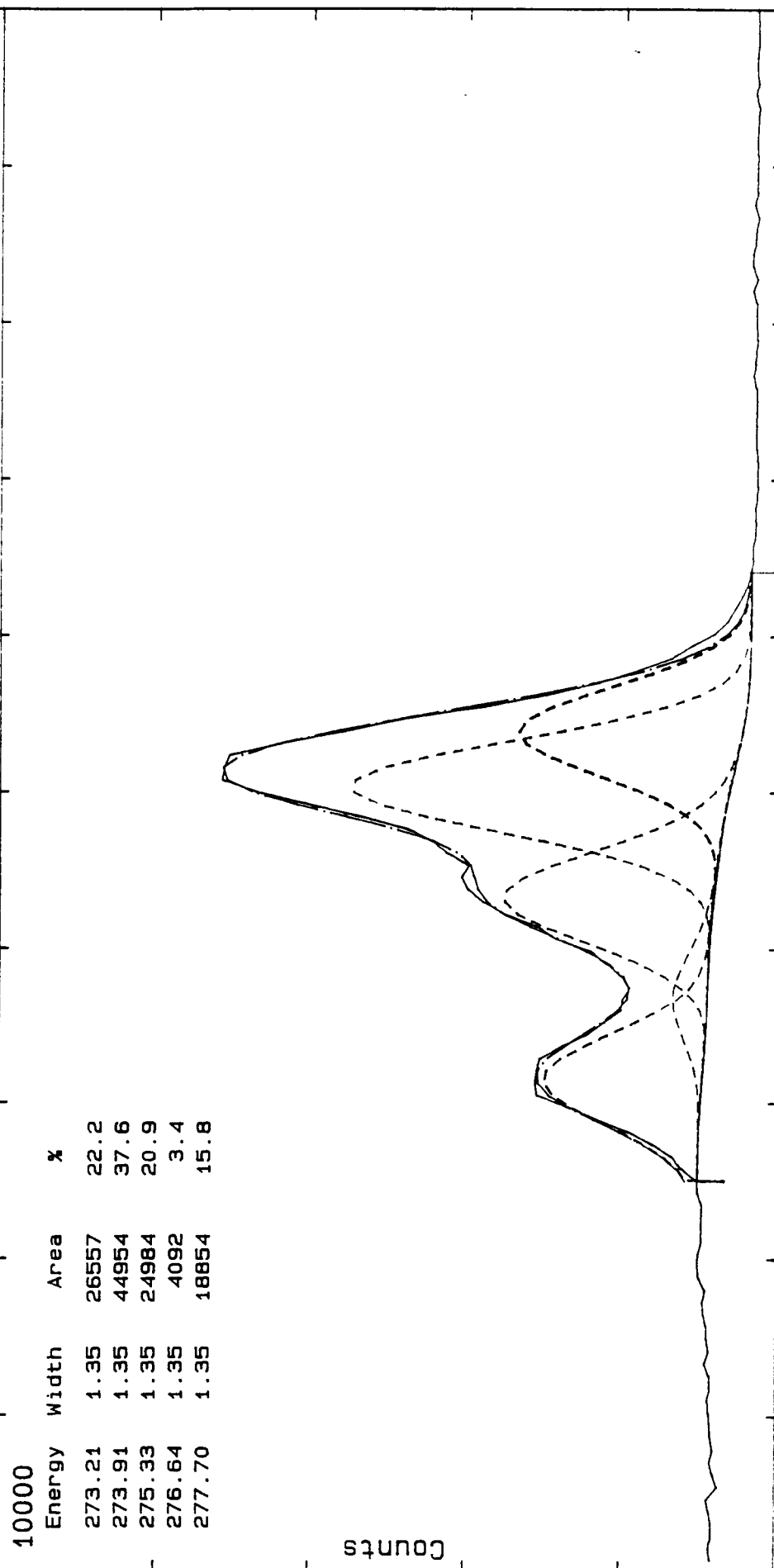
294.0 Binding Energy (eV) 274.0



File: MYLAR02	Date: 8/25/1988	Spot Size: 1000 u	Flood Gun: 9.0 eV
	Disc: NASA02	# of Scans: 5	Resolution: 4
Description: MYLAR-11, PLASMA EXPOSED: 45 DEG C, 60 W, 75 MIN. Operator: WBC			
CHARGE NEUTRALIZATION SCREEN			

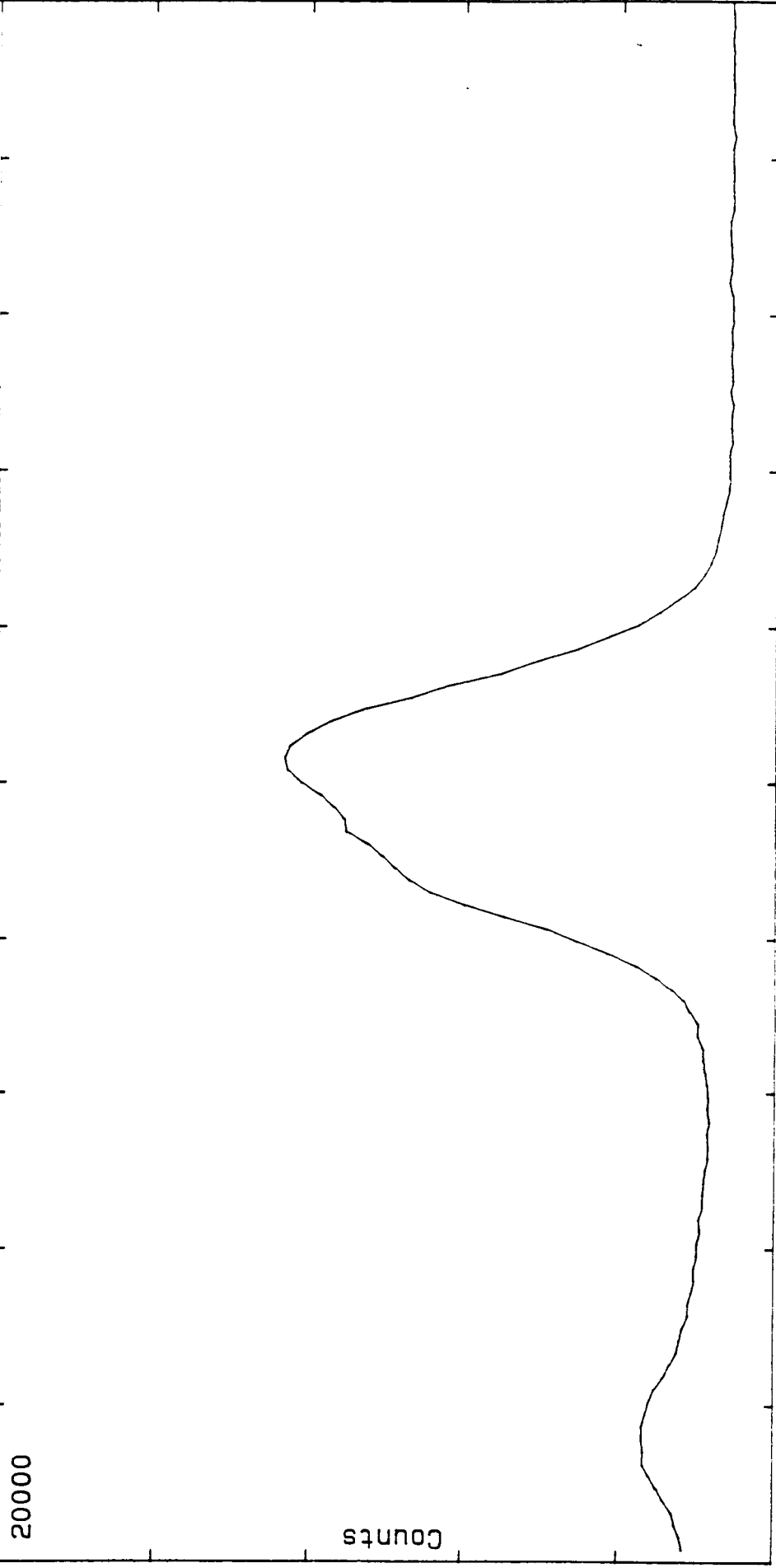


File: MYLARMRS03	Date: 8/25/1988	Spot Size: 300 u	Flood Gun: 9.0 eV
Region 1	Disc: NASA02	# of Scans: 30	Resolution: 2
Description: MYLAR-11, C 1s SPECTRUM, PLASMA EXPOSED: 45 DEG C, Operator: WBC 60 W, 75 MIN., CHARGE NEUTRALIZATION SCREEN			

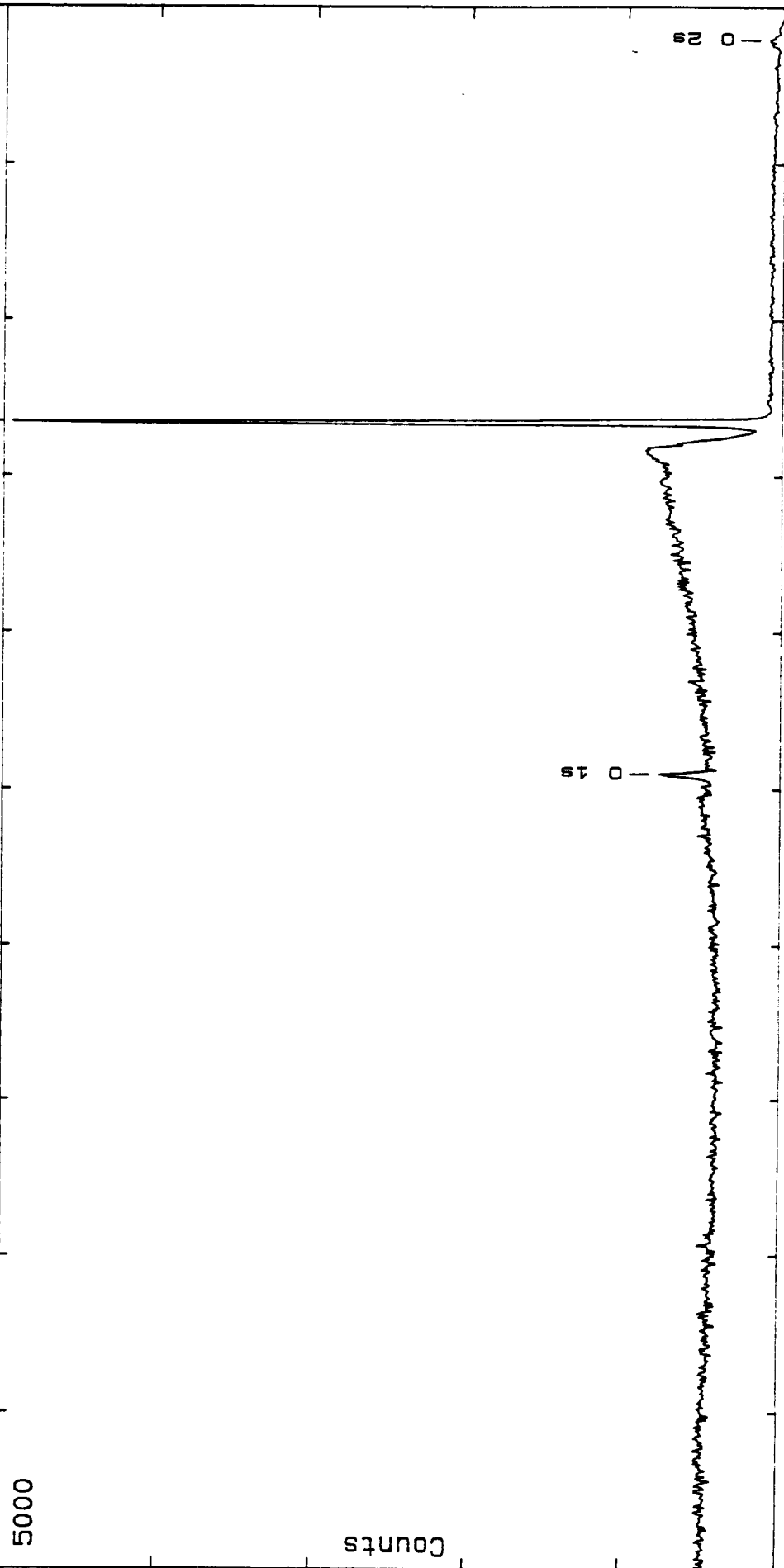


File: MYLARMRS03	Date: 8/25/1988	Spot Size: 300 u	Flood Gun: 9.0 eV
Region 2	Disc: NASA02	# of Scans: 30	Resolution: 2

Description: MYLAR-11, 0 1s & Sb 3d SPECTRUM, PLASMA EXPOSED: 45 DEG C, 60 W, 75 MIN., NEUTRALIZATION SCREEN



File: PPROPMS01	Date: 8/26/1988	Spot Size: 1000 u	Flood Gun: On, 0 eV
Region 1	Disc: NASA02	# of Scans: 1	Resolution: 4
Description: POLYPROPYLENE CONTROL CHARGE NEUTRALIZATION SCREEN			
		Operator: WBC	



File: PPR0PMRS01

Date: 8/26/1988

Gun: 300 u

Pressure: On, 0 eV

Region 2

Disc: NASA02

of Scans: 10

Resolution: 2

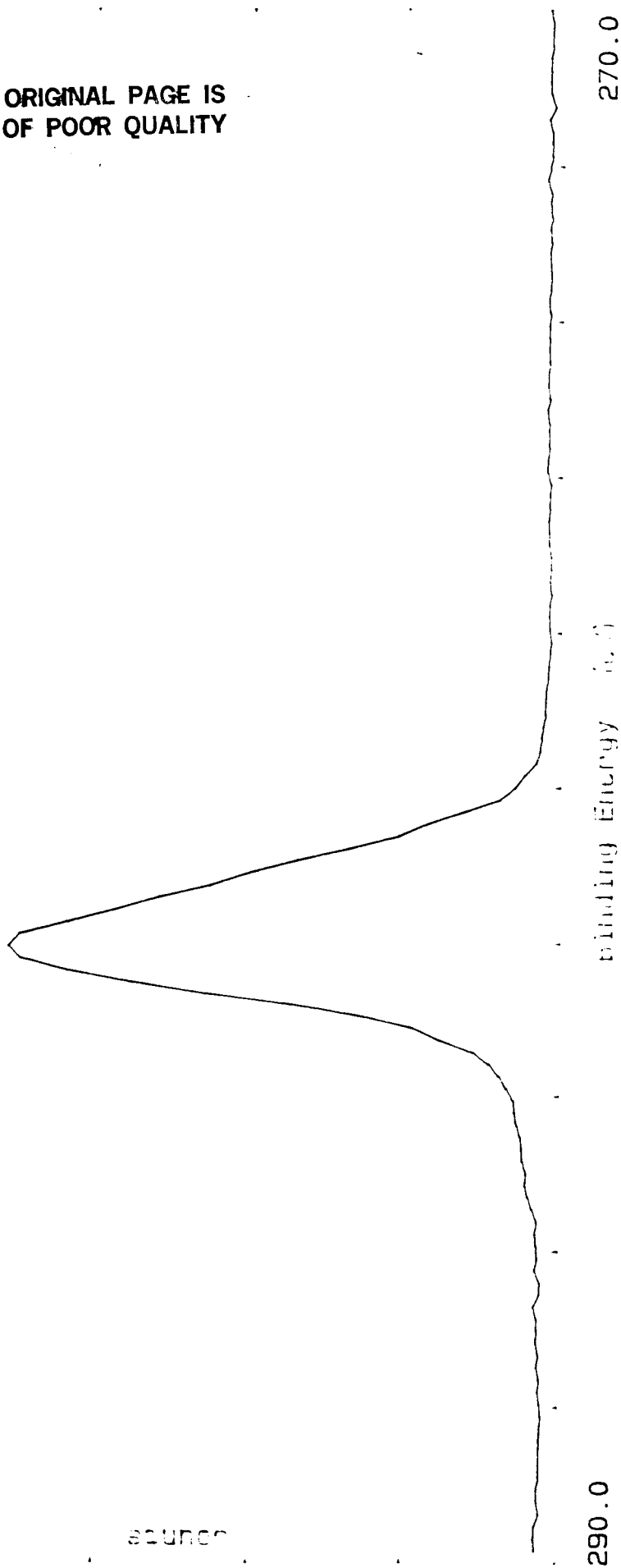
Description:

POLYPROPYLENE CONTROL, C 1s SPECTRUM
CHARGE NEUTRALIZATION SCREEN

Operator: WBC

5000

ORIGINAL PAGE IS
OF POOR QUALITY



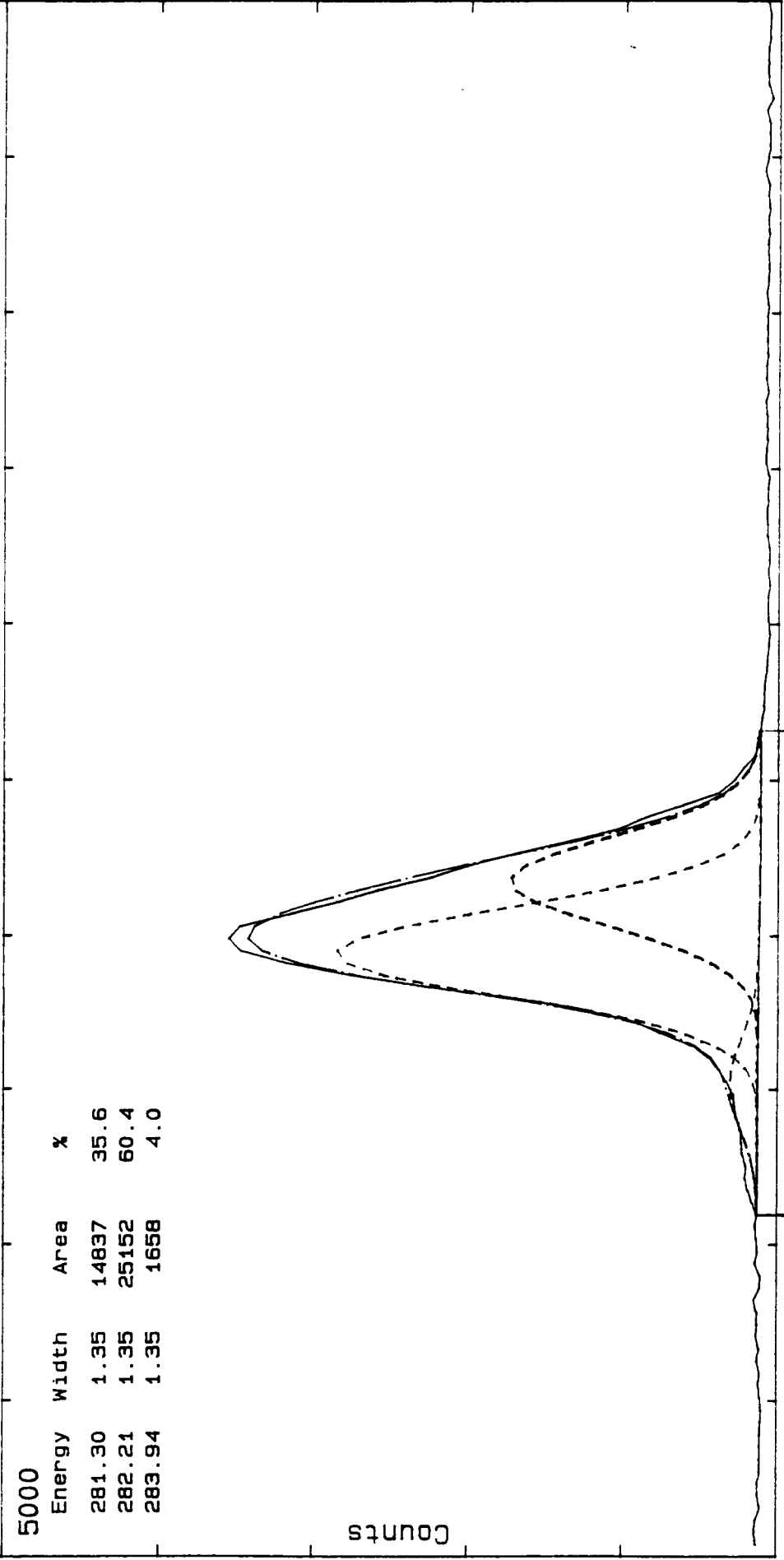
290.0

Binding Energy (eV)

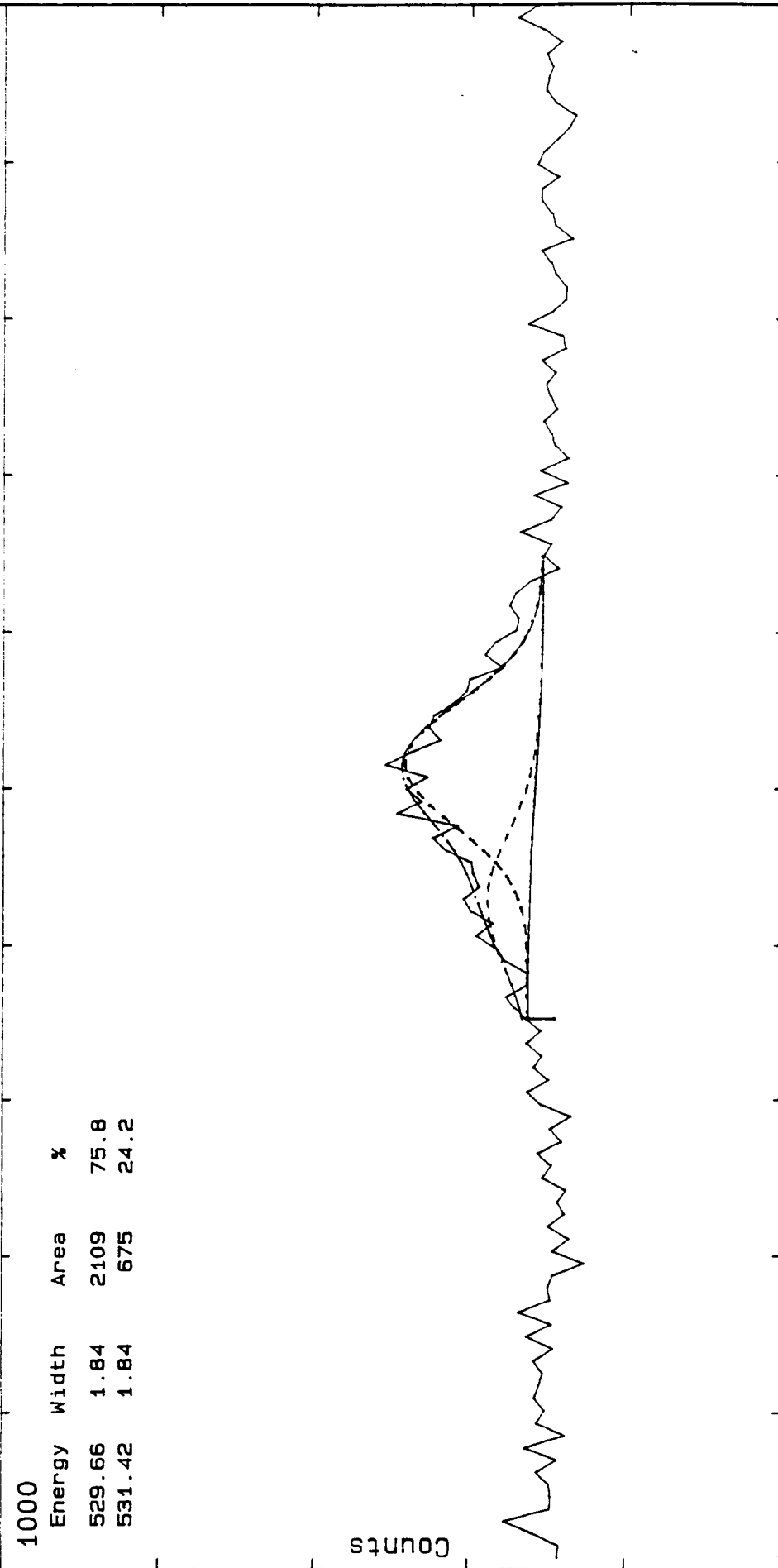
270.0

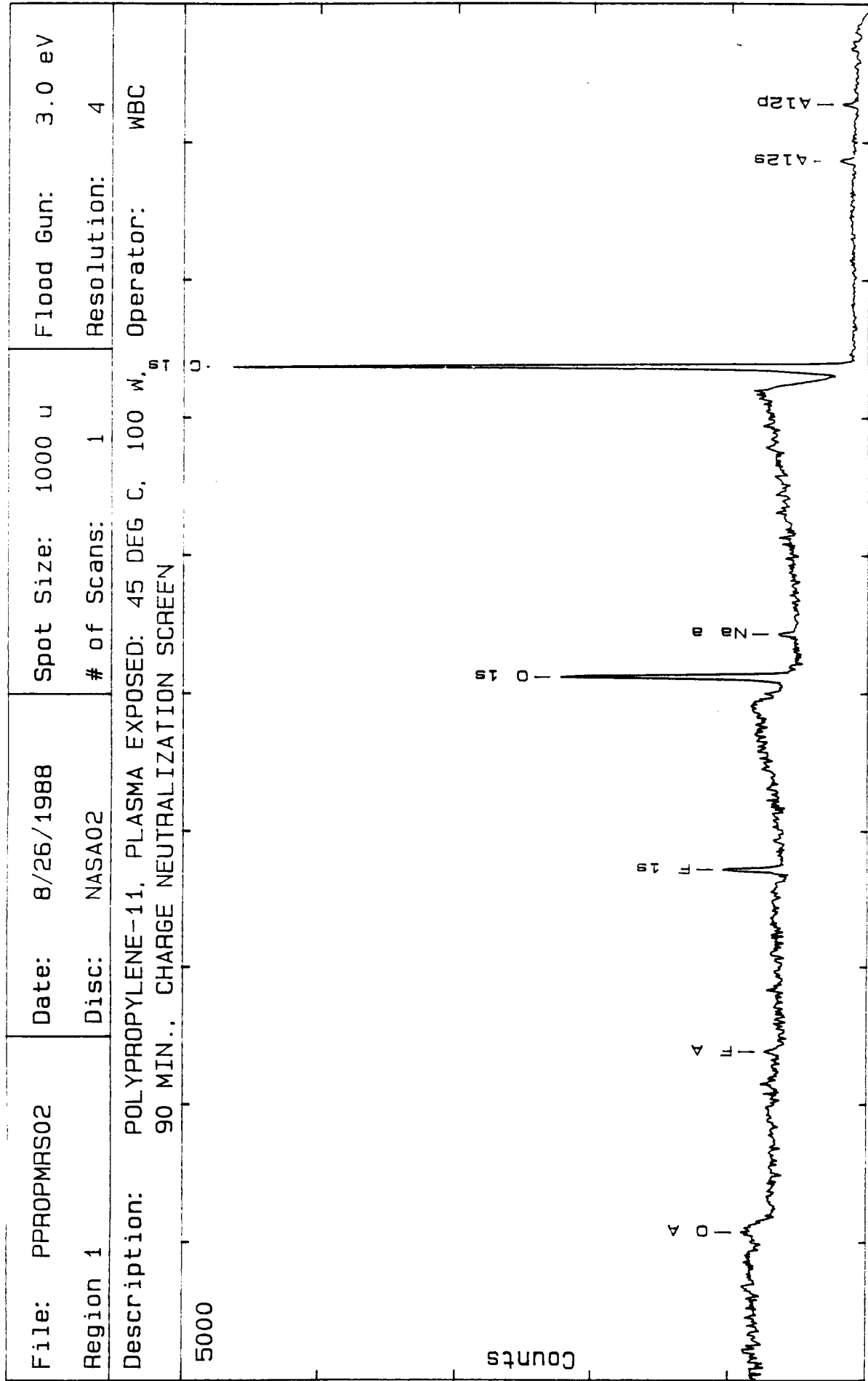
Report #: MSFC-02

File: PPROP MRS01	Date: 8/26/1988	Spot Size: 300 u	Flood Gun: On, 0 eV
Region 2	Disc: NASA02	# of Scans: 10	Resolution: 2
Description: POLYPROPYLENE CONTROL, C 1s SPECTRUM CHARGE NEUTRALIZATION SCREEN			
Operator: WBC			

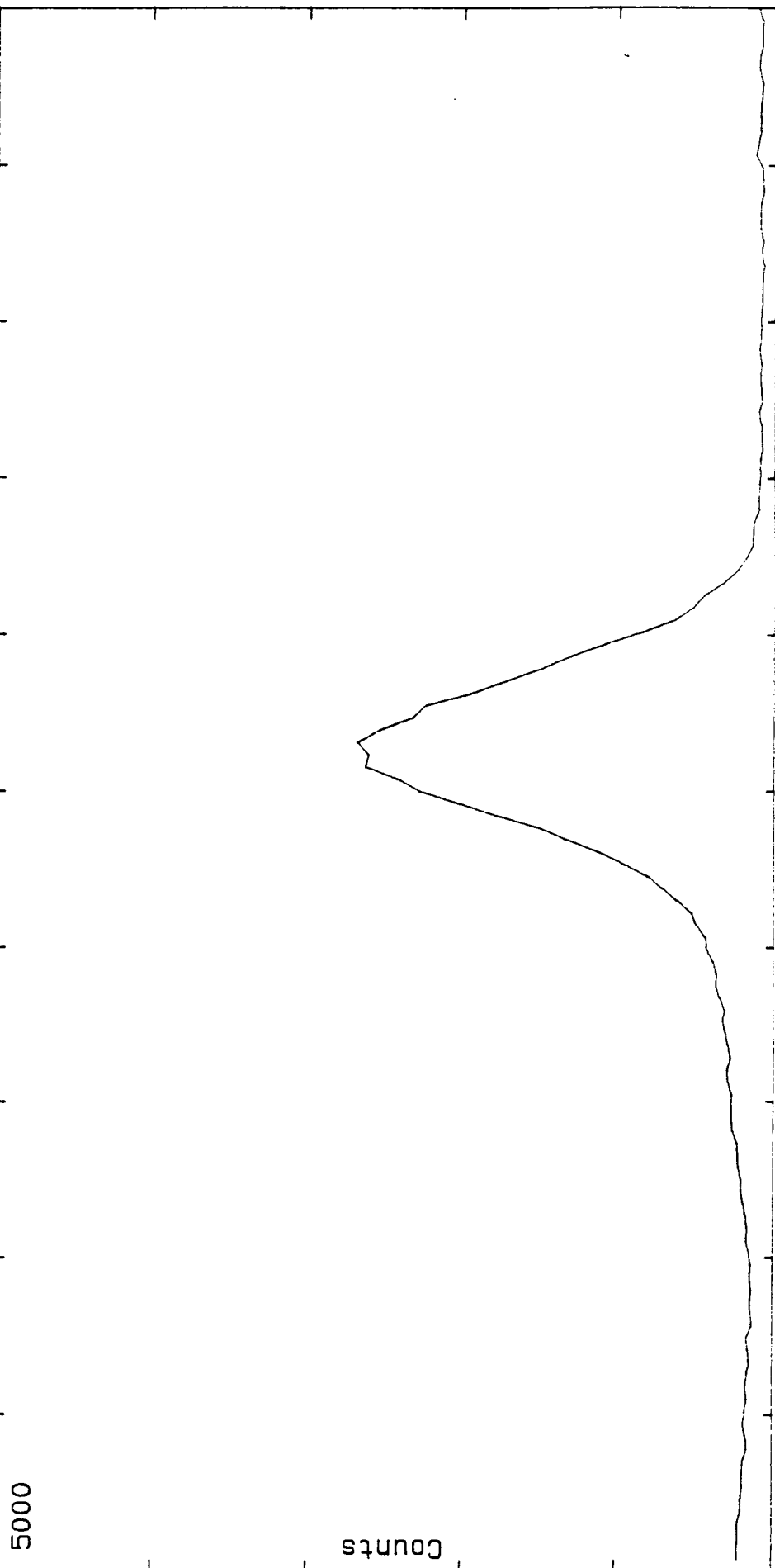


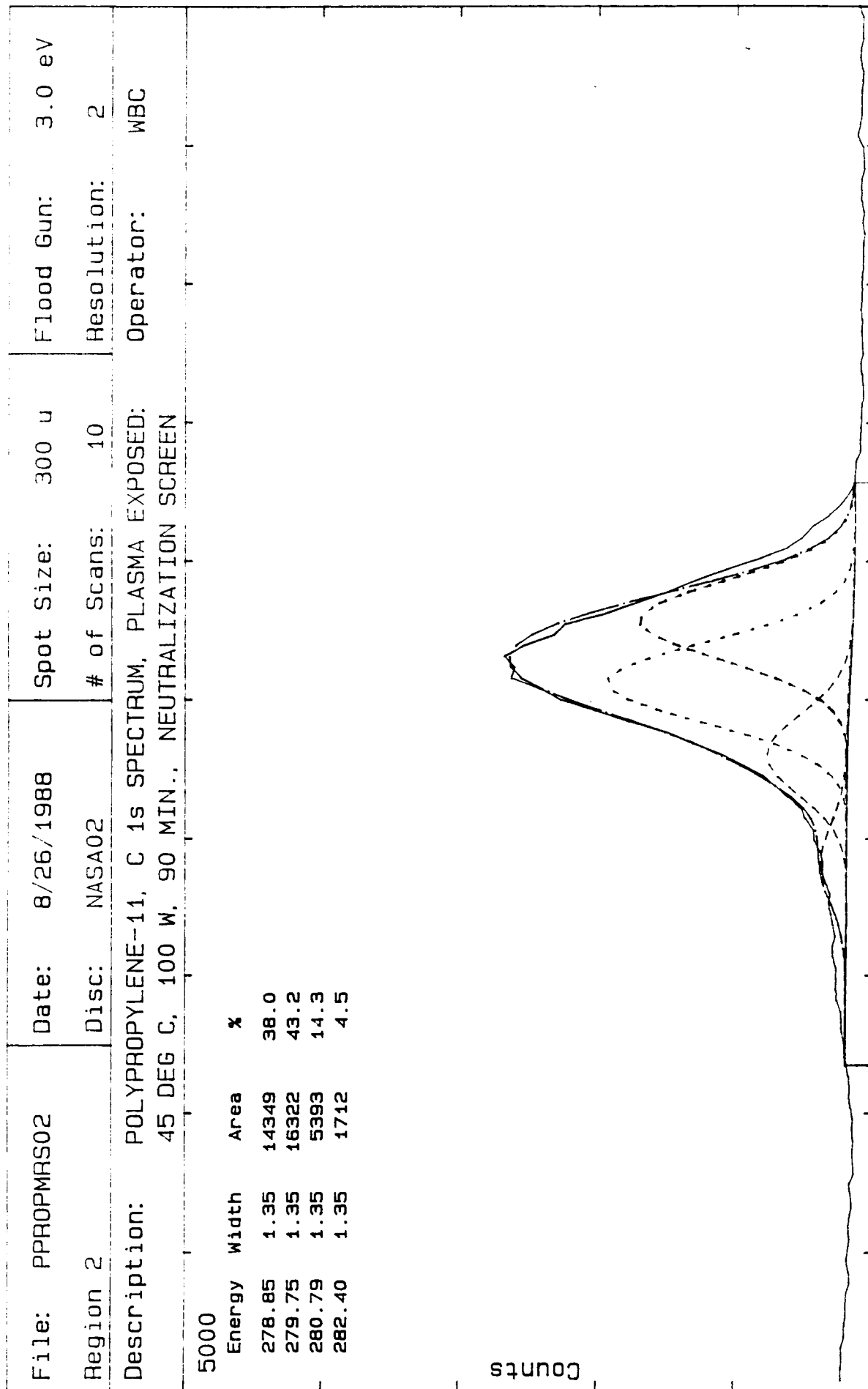
File: PPROP MRS01	Date: 8/26/1988	Spot Size: 300 u	Flood Gun: On, 0 eV
Region 3	Disc: NASA02	# of Scans: 10	Resolution: 2
Description: POLYPROPYLENE CONTROL, 0 1s SPECTRUM CHARGE NEUTRALIZATION SCREEN			
Operator: WBC			





File: PPROPMS02	Date: 8/26/1988	Spot Size: 300 u	Flood Gun: 3.0 eV
Region 2	Disc: NASA02	# of Scans: 10	Resolution: 2
Description: POLYPROPYLENE-11, C 1s SPECTRUM, PLASMA EXPOSED: 45 DEG C, 100 W, 90 MIN., NEUTRALIZATION SCREEN			
Operator: WBC			





290.0

Binding Energy (eV)

270.0

Report #: MSFC-02

